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BBC ACORN USER



GAMES SPECIAL

We rate the top ten games and preview the best releases



GRAPHICS A-Z

We crunch words in this jargon-busting guide to graphics



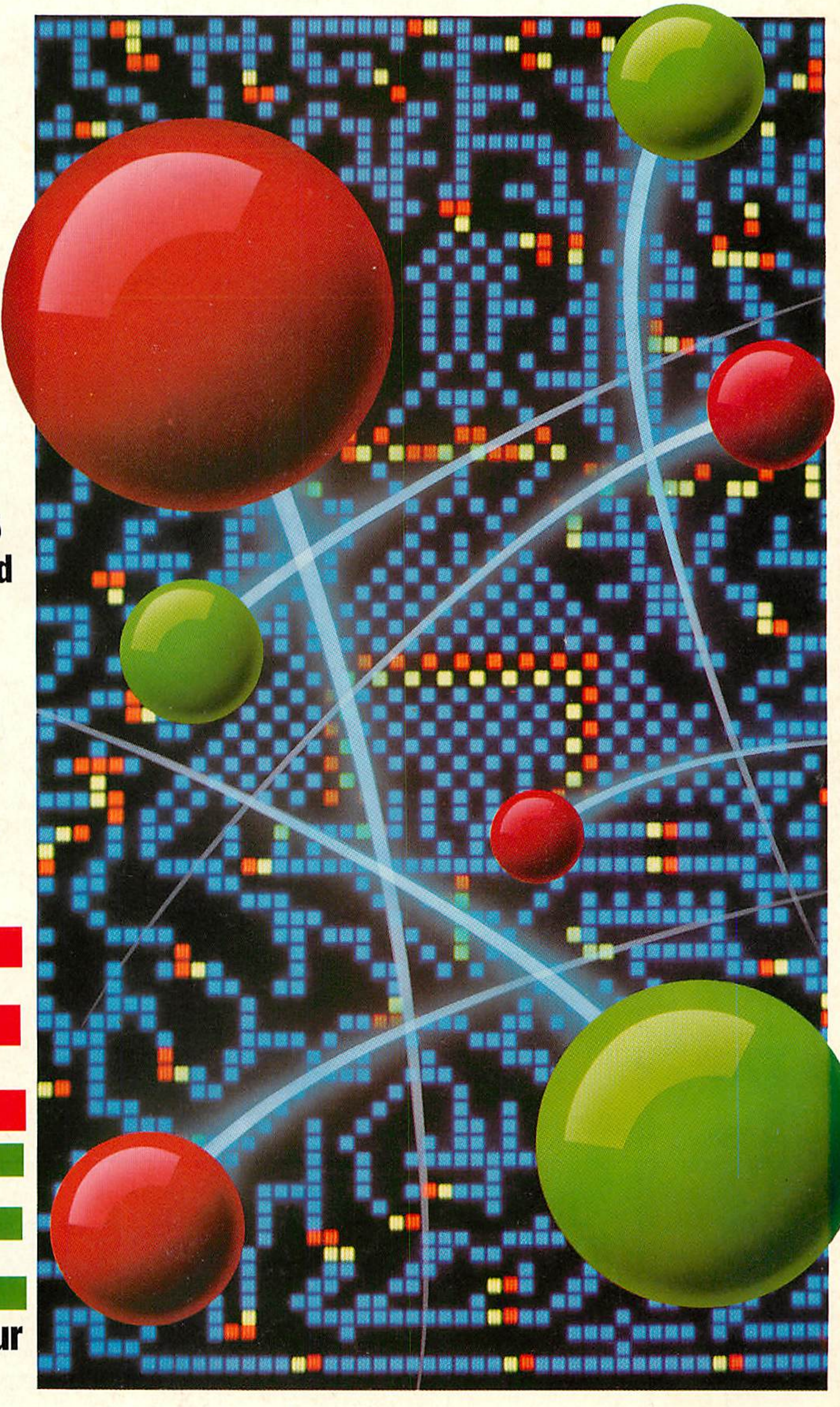
MEGA-MONITOR

Does Taxan's 795 break new ground in colour monitor quality?



KEEPING TIME

Is Minerva top of the class with Timetabler? Read our review



LIVE WIRE

Shock! Horror! Plug into our current affairs program

SQUIRREL

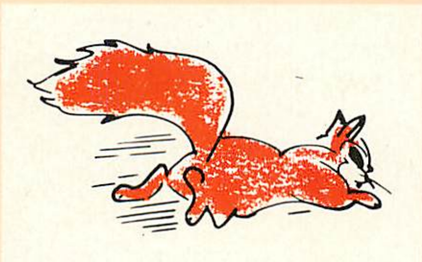


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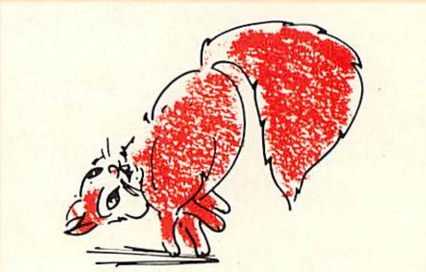
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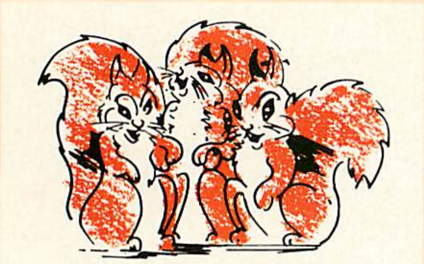
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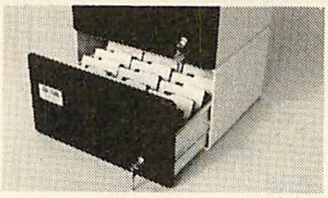
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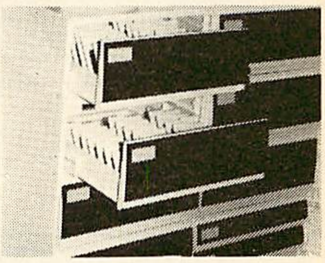
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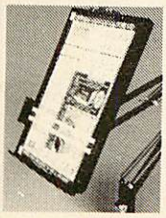
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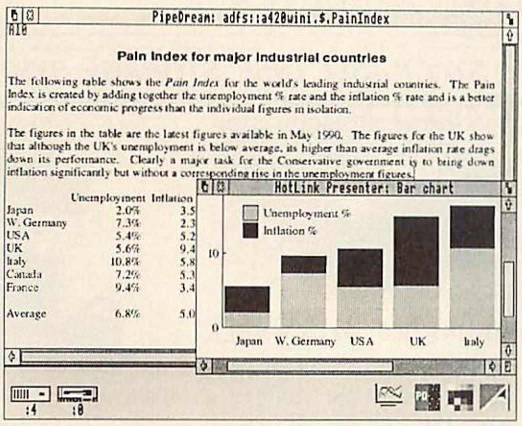
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PIPEDREAM 3

WINNER
of the 1989/90 BBC Acorn User Award for Best 32-bit Business Software



The bar chart in the screen shown above was produced by using the HotLink between PipeDream 3 and HotLink Presenter.

Major features include:

- intuitive RISC OS user interface
- many documents loaded at once
- display and printing of pictures within text
- wysiwyg display including all RISC OS fonts
- built-in 93,003 word spelling checker
- file compatibility with PC & Z88 PipeDream & BBC View Professional
- natural, background recalculation
- keystroke compatibility with Z88 & PC PipeDream
- Z88 filing system
- automatic loading of VIEW, ViewSheet, Lotus, First Word Plus, Tab and CSV files
- automatic saving of VIEW, Lotus, Tab, CSV and Acorn DTP format files
- multi-field sorting
- 62 spreadsheet and database functions
- external references between documents for 3-D modelling
- macro file recorder
- slot protection

colton software

PipeDream 3 breaks down the barriers between word processor, spreadsheet and database. With PipeDream 3, you can include numerical tables in your letters and reports, add paragraphs to your spreadsheets, and perform calculations within your databases.

PipeDream 3 has been written to take full advantage of RISC OS – if you can use RISC OS, you can use PipeDream 3. It is fully multi-tasking and multi-windowing, so you can work on many documents at once and instantly move information between them. PipeDream 3 can automatically load and save most popular file formats and is the first program to use the new RISC OS HotLink, which enables it to interact dynamically with Archimedes graphics programs, such as *HotLink Presenter* from Lingenuity and *GraphBox* from Minerva.

As well as winning the 1989/90 BBC Acorn User Award for Best 32-bit Business Software, PipeDream 3 was runner-up in the Best 32-bit Educational Software and Best 32-bit DTP/Word Processor categories.

PipeDream 3
Breaking down the barriers

POWER • SPEED • FLEXIBILITY • EASE OF USE

PipeDream 3 is for all Archimedes computers with 1Mbyte or more of RAM, including the A3000.

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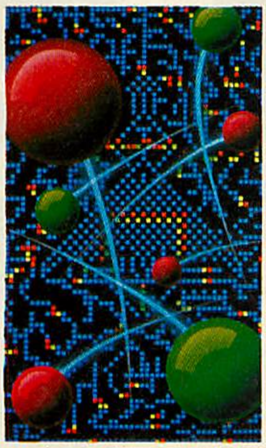
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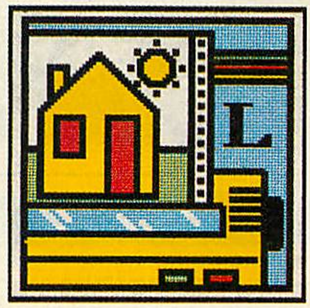
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64 **WIRED UP**

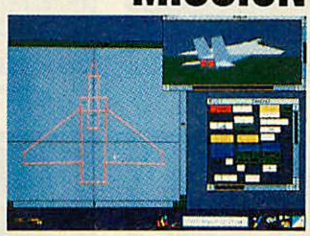


Cover illustration by Paul Allen

72 **A-Z OF GRAPHICS**



144 **THE SECOND MISSION**



82 **HEAD COUNT**



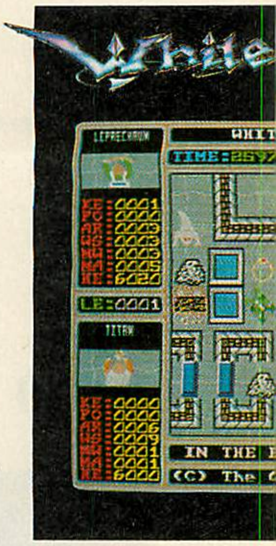
ARCHIMEDES
BBC MICRO
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THE 4TH



E-TYPE
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U.I.M.

U.I.M. is a massive 3D arcade adventure set in the future. 2½ years of dedicated design and programming have produced this massive game. The "greenhouse" gases melted the icecaps and all life now exists in the oceans. There are over 65000 underwater ports each with their own colonies.

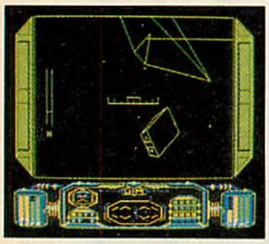
You must travel the oceans, trading in commodities, shares and currency. There are over 250 missions to complete before you will find your goal - the U.I.M. - created to be almost a god! Your craft is a highly manoeuvrable (and expandable) futuristic submarine named Black Satyr.

On your travels you will encounter many submarine types. Many of the most advanced and aggressive submarines do not appear until you reach later networks of ports. In addition you will also meet the Replicants - man-made underwater machines which have gone "renegade" and are capable of reproduction.

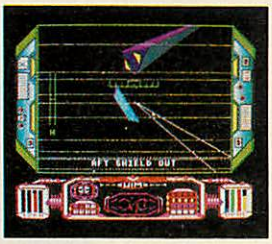
As you progress it is therefore essential to avail yourself of the highly sophisticated range of combat and defensive equipment available. The quest for the U.I.M. will be long and involved, the dangers intense, but the reward priceless!

"Will I keep playing it the way I've played Elite for years? And the answer is YES. Graphics 10, Playability 10, Value for Money 10"........................*The Micro User, Nov' 89.*

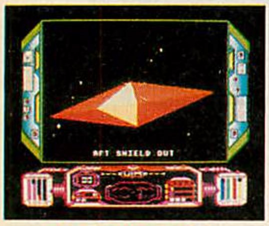
U.I.M. is disc only and will run on BBC B or B+ with 16K of sideways RAM, BBC Master series and all Archimedes Computers.



BBC



ARCHIMEDES



ARCHIMEDES



ARCHIMEDES

E-TYPE

Take control of £70,000's worth of gleeming "E-Type" and head off for the drive of a lifetime. Hear the digitised roar of the 5.3 litre 12 cylinder engine as you tear along lanes, motorways and desert tracks at over 150 mph.

"E-Type" takes racing simulations into the world of 32 - bit RISC processing and gives you smoother, faster and more detailed graphics than you are even likely to see in the arcades.

E-TYPE

"On the Archimedes the illusion of speed is terrifyingly real and the way the landscape moves in three-dimensional perspective is a joy - a stunning experience"...........*The Independent, Dec' 89*

"This is a superb game....the tracks are fantastic".........*The Times, Dec' 89*

"No race game, on any other machine, looks as good"............*The Times Educational Supplement, Dec' 89*

"For challenging races with a real sense of speed and fun, go for E-Type's ignition key".............*The Games Machine, Feb' 90*

"There's just one word to describe E-Type: FANTASTIC! Graphics 10, Value for Money 10"............. *The Micro - User, Dec' 89*

"The graphics in E-Type are really superb. E-Type in my opinion is probably the best game yet for the Arc".... *Risc User, Dec' 89*

E-TYPE DESIGNER & EXTRA 100 MILES

Design your own "E-Type" tracks with this highly advanced but simple to use designer. It is enormously flexible to produce an endless variety of tracks to challenge you and your friends.

"The perfect complement to E-Type"... *The Games Machine, Feb'90*

There is also an extra tracks disc featuring extra sprites and 100 miles of cunningly designed roads.

Please note that you will need the original E-Type game to use either the Designer or the Extra Tracks discs.



ARCHIMEDES



ARCHIMEDES



ARCHIMEDES



ARCHIMEDES

WHITE MAGIC

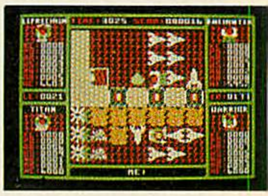
White Magic is a unique arcade adventure in which you control 4 varied adventures:-

Kaldor the Leprechaun, Cheysul the Titan, Moriana The Warrior and Mandrake the Enchanter.

You can transform between all 4 characters at will and use their much needed special abilities.

It features 32 massive action-packed levels filled with aggressive guards and trolls, haunting ghosts and spectres, curious objects to find and use, and much more .....

White Magic is not a game for the faint-hearted; it is a fast-action game which requires fierce hand - to - hand combat and frantic weapon fire.



BBC



ARCHIMEDES

APOCALYPSE

Produced by Gordon Key, the author of Holed Out and E-Type, this incredible new game sets new standards of excellence in 3-dimensional solid graphics and digitised sound effects. Your overall task is to rescue a whole solar system from an evil dictatorship. Apocalypse is a feast for your eyes, ears and grey matter.

Release date: 5th March, 1990.
See your dealer or ring for your copy today

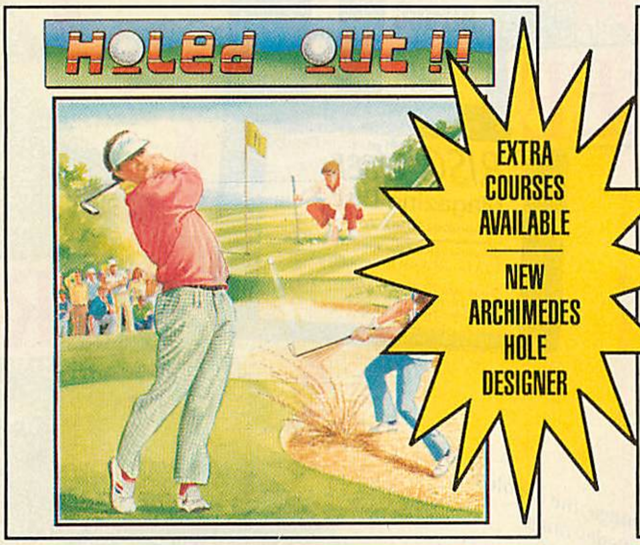
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Arcade Soccer	19.95	12.95	9.95	13.95
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Holed Out Extra Courses 2	16.95	11.95	9.95	12.95
Holed Out Designer	19.95	-	-	-

* E-Type BBC & Electron versions due for release 7th May, 1990. All the above Archimedes games will work on the Archimedes A3000, 310 and 400 series

DIMENSION

ARCHIMEDES
BBC MICRO
ELECTRON







WHITE MAGIC 2

This includes 32 brand new and highly dangerous levels plus a complete level designer.

The level designer is a doddle to use and can be used to alter or design levels from scratch.

An extra invisible feature in White Magic 2 will really confuse our adventurers!

Reviews of White Magic

"The graphics are superb .... An absolute winner"
Electron User Golden Game August '89.

"Playability is good and I had to tear myself away in order to write this update review."
Archie review - The Micro User, October 1989.

HOLED OUT

The most comprehensive, realistic and highly acclaimed golf simulation on the market today. This volume contains the original 2 contrasting 18 hole courses and comes complete with an easy to follow 16 page manual.

"I play golf and this game is the closest thing I've seen to the real game on a computer". *Archive, June 1989*
"I wouldn't have thought it possible to get a better simulation out of the beeb".
BBC Acorn User, June 1989

"The 3D perspective graphics are stunning"............***Electron User GOLDEN GAME June 1989***

"Holed Out is great ..... The game plays very well and the graphics are superb"...............
Popular Computing Weekly. March 1989

"The Electron version is brilliant - it's almost the same as playing at Gleneagles. Unreservedly recommended"................. ***A & B Computing Game of the Month, June 1989***

HOLED OUT EXTRA COURSES

In response to your many requests we have now produced 2 volumes of extra courses. Each volume contains 2 superbly designed brand new courses. Each course has been meticulously created to test your golfing abilities to the limits. The holes are very varied and even Nick Faldo would need to use his skills to keep up his recent record.

ARCHIMEDES HOLE DESIGNER

Create your own golf courses with this easy - to - use yet highly sophisticated hole designer. Its flexibility allows you to define all aspects of the holes from their pars to the position and size of the lakes. It will keep you enthralled for years.

"The Holed Out Designer is very easy to use and it makes a perfect complement to the original game"........
The Micro - User, Jan' 90

ARCADE SOCCER

Arcade Soccer really is football action at its very best.

Using an overhead view to make game play as exciting as possible it features everything that you could want in a football game. Corners, sliding tackles, throw-ins, goal kicks, dribbling, shooting, passing and much more. But not only does Arcade Soccer give you Total Action it also puts you in Total Control.

Firstly you can play with either keyboard or joysticks, against the computer and/or with up to 23 friends. The options are almost limitless; you can choose the skill of the goalkeepers, the speed and length of the game, play "friendlies" or tournaments and even enter the most coveted of championships - the World Cup.

"The game is very playable and you do get a feeling of involvement as you knock the ball into the corner of the net straight past the diving goalie. It's definitely one to play again, and if you've enough friends it could make for a good day of enjoyment - and not a lot of games can do that. Value for money ... 10 out of 10"......
The Micro User, October "89.

"This game is excellent ... I'm not a real soccer buff, but I thoroughly enjoyed this desktop version. The micro-controlled players behave in an amazingly realistic manner. Playability 10." ... ***Archimedes review, The Micro user, Feb' 90***



ELECTRON



BBC



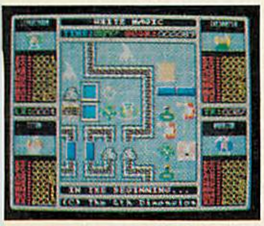
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SECOND COMING FOR GENESIS PACKAGE

The long-awaited follow up to *Genesis*, Software Solutions' multi-tasking relational database package, is due for release in January next year.

However, *Genesis II* will make its debut at the Acorn Conference at the Computer Shopper Show (Wembley Conference Centre, December 6-9).

According to David Tee of Software Solutions, the presentation will be 'Hypermedia for All, extending the fundamental ideas of *Genesis* into a simple but powerful way of creating multi-tasking desktop applications without the need to understand the complexities of the Risc operating system.'

The company is currently putting the finishing touches to this latest version of *Genesis*, which will be officially launched at the BETT 91 show in January (see separate item). At the time of going to press, no detailed specifications were available, although improvements in its multi-tasking operation are anticipated. However, review copies are expected to be released within the next few weeks – watch out for more info in the next issue of *BAU*.

● A new *Level 4* fileserver, developed by Acorn and Software Solutions, is ready for release.

Unlike the previous hardware fileserver, the new version is a software-only package designed to run on any Archimedes that has at least 1Mb of memory and some appropriate disc storage.

It may be run as a desktop application, or in a stand-alone mode for maximum performance and security, to provide users with file access and mail facilities over Econet.

The fileserver can transfer files from any standard media type, including Winchester or floppy disc, CSI or ADFS, CD-Rom, or using the Internet Protocols to communicate to a remote host via Econet, Ethernet and NFS.

Compatible with existing Acorn fileservers, *Level 4* offers the advantages of Risc performance, flexibility and economy, allowing the server to double as a user machine on lightly-loaded networks and encouraging data share between work groups.

Also included is an advanced printer spooler, which can support multiple printers and Risc OS management software that can simplify setting up business procedures and day-to-day administration. Acorn is expected to debut the new product at BETT 91 in January.

For further information, contact Acorn on (0223) 214411.

BBC PD

After his letter about public domain software for eight-bit micros appeared in the August issue of *BAU*, Alan Blundell has received an enthusiastic response from readers.

'Many have already submitted software to the BBC PD library,' an enthusiastic Blundell told us, ' in fact, it already contains well over 1Mb after only a few weeks of operation.'

Programs in the library include a Small 'C' compiler, a programmer's help Rom, a spelling checker for *View* files, lots of music and games.

Contact: Alan Blundell, 8 Carlton Close, Blackrod, Bolton BL6 5DL.

PLAY IT YET AGAIN!

Released just in time for the pre-Christmas market, *Play it again Sam 14* from Superior Software features a compendium of games to keep BBC micro/Electron owners engrossed.

The disc/cassette features three previously available games: *Predator*, based on the well known Schwarzenegger film; *Superior Soccer*, featuring soccer action combined with management; and *Ballistix*, the fast-action ball game.

Star Port is a brand new game added to the package. From the author of *Quest* and *Camelot*, it involves rescuing medical supplies from a strange triangular space station. *Play it again Sam 14* costs £9.95 for BBC micro/Electron dual cassette, £11.95 for BBC micro 5.25in disc and £14.95 for BBC Master Compact 3.5in disc. Contact Superior Software on (0652) 58585.



BUILD UP TO BETT

Anyone interested in educational IT will be heading for London's Barbican in January for the BETT 91 show.

Organised by the British Educational Equipment Association, EMAP International Exhibitions and *BBC Educational Computing and Technology* magazine, BETT 91 aims to give visitors the chance to see how technology in the National Curriculum can be provided effectively across all subject areas.

Relevant to teachers at every level, the show will feature products and services from around 180 leading companies.

The Acorn Village will be the focus for making a unique record of the use of computers in schools in the 1990s. Acorn, together with Next Technology, Software Solutions and other software companies, will be making a CD-Rom disc at the show. Examples of pupils' work could be included on it – there is also a chance to win a complete CD-Rom system.

The free seminars at the show will focus on technology across the curriculum (see page 17).

BETT 91 will be held at the Barbican in London from January 16 to 19, 1991. For free tickets call 071-404 4844.

HARD TIMES

Despite difficult trading conditions, Acorn Computers held sales revenue of £22.1 million for the first half of this year. However, pre-tax profit on ordinary activities fell to £42,000. Also, the company's interest in Torus Group, now in receivership, led to a net loss of £242,000.

Editor Barry Monk. **Production Editor** Pauline McLernon. **Technical Assistant** Paul James. **Education Editor** Lisa Hughes. **Editorial Assistant** Christina Neal. **Ad Manager** Duncan Pringle. **Sales Executives** Richard Power, Jason Ross. **Ad Production** Fiona Andrews. **Production Manager** Jennifer Jeffrey. **Publisher** Seamus Geoghegan. **Publishing Director** Michael Potter. **Editorial Director** Christopher Ward.

ABC Member of the Au Bureau of Circulat

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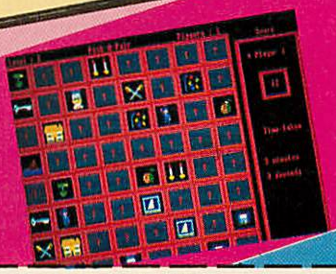
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BRILLIANT NEW IDEAS

Brilliant Computing, the Bradford-based special needs computer software supplier, has continued to develop its products for the BBC B and Master micros. Two new products supplement the company's catalogue. *Touch Fun Fair* is a set of five programs on the fun fair theme for the BBC micro and Microvitec Touch Screen. Designed to encourage basic language and co-ordination skills, each game tests different levels which can be easily controlled.

Pathfinder consists of two programs on one disc – *Join the Dots* allows users to practice touching specific points on the touch screen, while *Follow the Path* involves finger movement across the screen along different paths.

Now the company has rewritten some of its programs for the A3000/Archimedes and has been working closely with Microvitec and Acorn to develop the use of the Touchtec 501 Touchscreen with the Arc range.

Contact Brilliant Computing on (0274) 497617.

MAGPIE FLIES

Hot on the heels of *Archimedes Pendown* comes Longman Logotron's *Magpie*.

Designed to allow the creation of pages, text, graphics, 'buttons' and digitised sound, *Magpie* is a new authoring system which enables users to build 'binders' of materials on a variety of topics.

Offering applications in both presentation and teaching, the package is evidently easy to use.

As a simple desktop publisher it can be used in conjunction with Armadillo's sound sampling board and *Armadeus* from Clares, to incorporate digitised sound into the pages. A recording system is part of the software.

Contact Longman Logotron on (0223) 323656.

ME AND MY SHADOW

A robot called 'Shadow' was one of the attractions at the First International Robot Olympics in Glasgow last month. And, unlike the 52 other competitors, it was controlled by an Archimedes A440.

Robots (and their owners) from around the world gathered at Strathclyde University for the events, which included two-, four- and six-legged races and javelin tournaments.

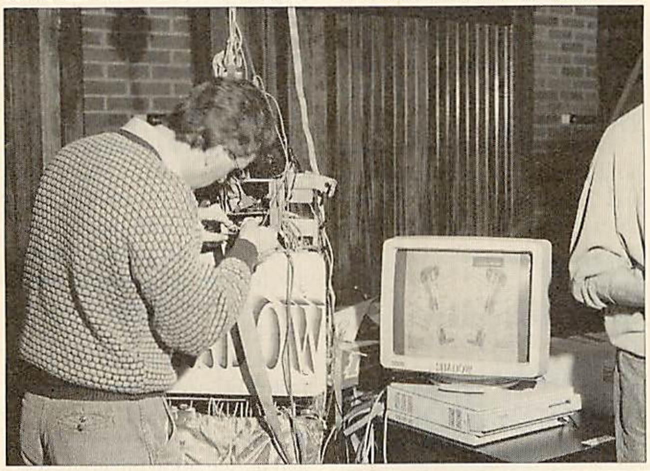
The Shadow robot has two legs and is controlled using pneumatic muscles, which work in a similar way to those of a human. The muscles receive air from a set of valves acting like lungs which are switched on and off by the 'brain' – a few boards of dense electronics, which in turn plug into the 1MHz bus on the back of the Arc.

The intention is for Shadow to become the world's first domestic robot, enabling it to – among other things – clean and tidy around the house.

A small amateur group based in London is behind the wires and tubes, and five Archimedes machines, spread around the group, are involved. The Arcs have also been used to program several neural net simulations to teach Shadow to walk and recognise objects seen through a video camera.

For more information on the Shadow project (and how to become involved), write to *BAU* and we'll pass on details.

Sam Greenhill





THE NEW APEX PODULE

Broadcast-quality colour images will soon be possible on the Archimedes, thanks to a new expansion board.

The APEX (Archimedes P3 Expansion) board from Millipede Electronic Graphics incorporates four P3 (pixel pipeline processor) chips, together with an Arm3 processor running at 27MHz.

According to Millipede's founding partner, Richard Jozefowski, APEX is designed to become a major hardware platform for applications in television, video, imaging, research and presentation graphics. 'The Archimedes is the perfect base for a top-line graphics system,' said Jozefowski. 'APEX represents a return to our Acorn roots – however, developing our own processor chip was the only way we could produce a system with the power and flexibility our customers expect.'

The P3 provides the high speed data processing required to generate and manipulate images in real time. When clocked at 13.5MHz, it can perform up to 54 million pipeline arithmetic operations per second. It also supports multiple hardware windows (sprites) which can be animated in real time with up to 256 levels of transparency. Supporting broadcast quality graphics at 32 bits per pixel, video data can be input and output in a variety of formats.

APEX has already attracted interest from third party software developers and Millipede has entered into a licensing agreement with Acorn to enable Risc OS graphics functions to be fully emulated.

APEX is due to be released early next year and is expected to cost £2750 with 4Mb of Ram. A version with 16Mb will cost £3900.

For further details contact Millipede Electronic Graphics on (0284) 850594 .

NEWS IN BRIEF

● LTS has released a new catalogue, called *Desktop Solutions*, which contains details of new products, as well as support materials for existing packages. Included are Newsmaster, Printmaster and Graphics. Contact LTS Ltd on (0386) 792617.

● Qume has moved its UK headquarters to Bridgewater Close, Reading, Berks RG3 1JT. Tel: (0734) 584646. Technical support, training, distribution and warehousing divisions are already sited there.

● Following recent changes to Lingenuity's CSI interface card and its software, the company is now supplying high-quality hard drive packages capable of achieving among the fastest times available. Other recent additions to Lingenuity's range of CSI products include removable hard discs with fast access times.

Contact Lingenuity on 098-685 477.

● 'The Kiwi Connection' is the theme for the 4Mation stand at the BETT 91 exhibition at London's Barbican Centre in January.

A group of New Zealand programmers who have produced a number of the company's programs (including *Jiglet* and *Poster*) will be dropping in at the show and will give demos and advice. Apparently Mike Matson of 4Mation will be on hand to translate questions into Kiwi-ese...

● Recent ads for CadMust, the design system for digital and analog systems by Dutch firm Usarc, have carried details of the UK distributor, Kelator. Unfortunately, the latter is no longer handling Usarc inquiries. Details of CadMust should now be obtained direct from Usarc, Spuistraat 73, 1012 T, Amsterdam, The Netherlands. Tel: 01031 20 381534.

PRINTERS BLITZ MARKET

Times may be tough in the computer market, but that certainly hasn't stopped printer manufacturers from blitzing it with new products.

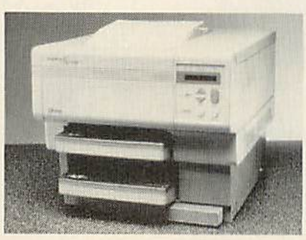
Various manufacturers have released details of new models, ranging from top-line laser printers to budget 24-pin versions.

● Qume's new CrystalPrint Express is a 12-page-per-minute laser printer, offering high resolution (600 x 300dpi) and both Postscript and HP LaserJet series II compatibility.

It has 31 fully scaleable resident fonts and a standard memory of 3Mb, expandable to 8Mb.

The Express features dual resolution modes – 600 x 300 and 300 x 300dpi – together with bitmap smoothing of text and graphics.

Two paper cassettes each hold up to 250 sheets of paper and an autoscan function enables automatic election from the second cassette when the first is empty.



The CrystalPrint Express costs £3750. Contact Qume Ltd on (0734) 584646.



● NEC claims to have launched the first sub-£400 wide carriage 24-pin dot-matrix printer.

The Pinwriter P30 is aimed at the low end of the market. It offers three operating modes: draft (216cps); high speed LQ (108cps) and near letter quality (72cps).

It includes 10 resident fonts with 19 national character sets. Resolution is 360 x 360dpi and an 8Kb memory buffer expandable to 16Kb with the serial interface kit. All printer settings are held in non-volatile memory and can be printed out for checking.

Price of the P30 is £399. Contact NEC Computer Peripherals on 081-993 8111.

● Aiming at the spreadsheet and presentation materials markets, Citizen has introduced the wide carriage version of the Swift 24 dot-matrix printer.

The Swift 24x (x for extra width!) offers features including a 24-pin printhead, offering two print speeds (192 and 64cps), plus the ability to handle A3-size documents. An envelope bin and automatic sheetfeeder are also included. Price is £489.

Contact Citizen Europe Ltd on (0895) 72621.



● If you are looking for 24-pin print quality that won't break the bank, look at Panasonic's new KX-P1123.

Available for around £299, the machine offers four letter quality fonts which can be printed at 63 or 192cps. Push/pull tractors and rear, top and bottom paper paths come as standard and there is an option for a cut sheet feeder.

Contact Panasonic Business Systems UK on (0344) 853551.

IMAGE SHOW SUCCESS

The recent Image Processing show at London's Wembley Conference Centre proved to be a good platform for Acorn-related products.

The Acorn stand was replete with third party image analysis and processing applications. Both new hardware and software were on display from Wild Vision, Foster Findlay Associates, Time Step, Salford University (collaborating with Acorn), Simis and Quantec Processing.

Wild Vision was demonstrating a new framestore, the V12, capable of displaying 512 x 512 pixels with 256 grey levels.

It also incorporates real-time video digitising without incurring any host processor overheads.

A new suite of image processing tools developed by Foster Findlay was obviously at home on the Arc. Called ArcImage 2, the suite runs together with a V10 framestore and, although it was shown on the new Archimedes A540, it will run on any Arc.

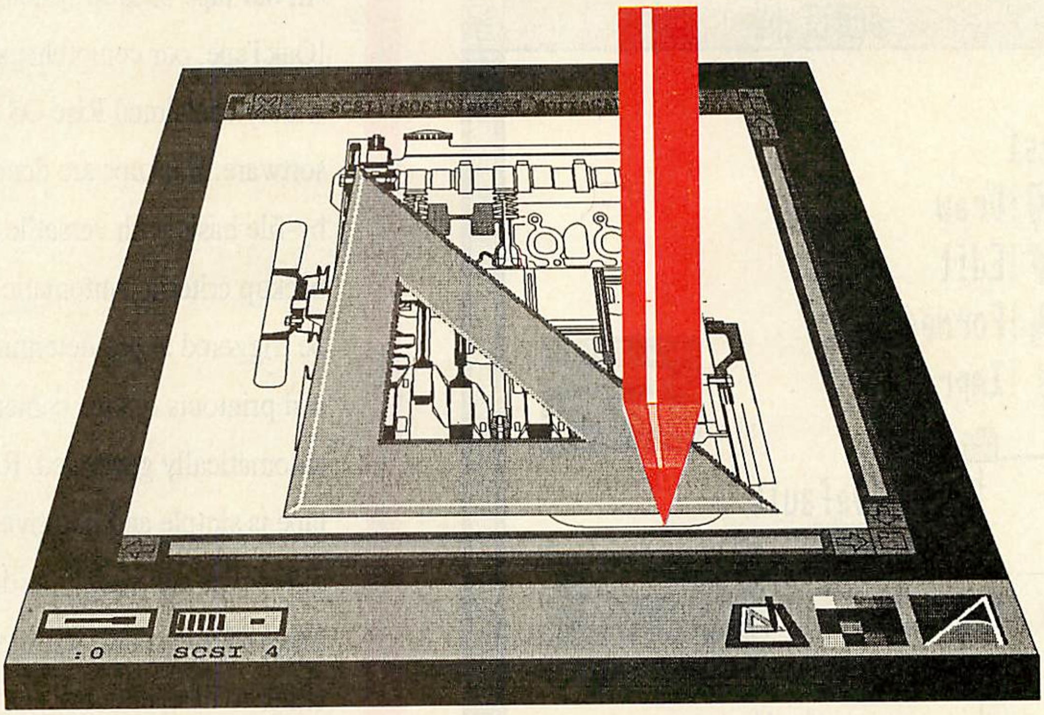
Simis was showing images obtained by using its medical/CT scan viewing system and hinted at a very fast graphics co-pro board for the next year.

An Arc-based Biomechanics Workstation attracted much attention. Salford University showed show real-time digitising and specialised software was used to map and analyse porting movements in order to detect injury cycles.

Real-time satellite weather imaging was on display from Time Step, with yet more sophisticated IP including bandpass separation and histogramming. The system comes complete with antenna, decoder, podule and software.

Richard Browning

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Internal SCSI Hard Disc with Controller Card for all Archimedes 310/400 series computers. Complete with controller card, drive unit, chassis, backplates, 'T' piece, all screws and cables.

HDINARC20SC	20Mb	375.00
HDINARC45SC	45Mb	495.00
HDINARC80SC	80Mb	699.00
HDINARC100SC	100Mb	925.00
HDINARC200SC	200Mb	1299.00

External SCSI Hard Disc with Controller Card for all Archimedes 310/400 series computers. Comes complete with controller card, connecting cables, backplates, 'T' piece and screws. Housed in a metal case colour matched to the Arc. with switch mode power supply and DC brushless fan.

HDEXARC20SC	20Mb	535.00
HDEXARC45SC	45Mb	655.00
HDEXARC80SC	80Mb	859.00
HDEXARC100SC	100Mb	1085.00
HDEXARC200SC	200Mb	1459.00
HDEXARC300SC	300Mb	2375.00
HDEXARC512SC	512Mb	2995.00

Additional External SCSI Hard Disc Drive. Up to 3 additional drives can be added to the Oak SCSI controller making 4 hard discs in total. For the Archimedes A3000, 310 and 400 series.

HDEXARC20SCA	20Mb	435.00
HDEXARC45SCA	45Mb	555.00
HDEXARC80SCA	80Mb	759.00
HDEXARC100SCA	100Mb	985.00
HDEXARC200SCA	200Mb	1359.00
HDEXARC300SCA	300Mb	2275.00
HDEXARC512SCA	512Mb	2895.00

A3000 External Hard Disc Drive with Controller Card. Comes complete with controller card housing, connecting cables. Drive unit housed in metal case, colour matched to the A3000 with switch mode power supply and DC brushless fan.

HDA3EX20SC	20Mb	535.00
HDA3EX45SC	45Mb	655.00
HDA3EX80SC	80Mb	859.00
HDA3EX100SC	100Mb	1085.00
HDA3EX200SC	200Mb	1459.00
HDA3EX300SC	300Mb	2375.00
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RDEXARC42SC	A310,A400	995.00
RDA3EX42SC	A3000	995.00
RDEXARC42SCA	A310,A400	895.00
RDA3EX42SCA	A3000	895.00
RD42CART	disc cartridge	99.00

SCSI TAPE STREAMERS

SCSI Tape Streamer with desktop software to allow easy and versatile backing up and restoring of data from SCSI and ST506 winchesters, networks etc. Comes complete with all cables. Housed in a metal case colour matched to the Archimedes with switch mode power supply and DC brushless fan. TS range uses DC600 type ¼" cartridge units, whilst the new cost effective CS range utilise 1/8" cassette style tape cassettes.

TS60SC (inc card)	60Mb	1099.95
TS150SC (inc card)	150Mb	1354.00
TS60SCA (exc card)	60Mb	999.95
TS150SCA (exc card)	150Mb	1254.00
CS20SC (inc card)	60MB	695.00
CS20SCA (exc card)	60Mb	595.00
CS60SC (inc card)	60MB	895.00
CS60SCA (exc card)	60Mb	795.00
CS150SC (inc card)	60MB	1095.00
CS150SCA (exc card)	60Mb	995.00
TAPE60 cartridge	60Mb	24.95
TAPE150 cartridge	150Mb	27.95
CASS20 cassette	20Mb	23.00
CASS60 cassette	60Mb	24.00
CASS150 cassette	150Mb	25.00

ST506 HARD DISC DRIVES

Archimedes A410 Internal Hard Disc Drives for use with 'on- board' ST506 winchester controller. Come complete with mounting chassis, screws, connecting cables and easy to follow fitting instructions.

HDINARC20ST	20Mb	199.00
HDINARC40ST	40Mb	315.00
HDINARC47ST	47Mb	399.00
Add on drives for SJ Fileserver		POA

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A3E10	21.00

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HDA3BEX20SC	20Mb	565.00
HDA3BEX45SC	45Mb	685.00
HDA3BEX80SC	80Mb	889.00
HDA3BEX100SC	100Mb	1115.00
HDA3BEX200SC	200Mb	1489.00

Monitor bridge mounted floppy drive, complete with buffer card, cable & PSU

FDA3B35	3.5"	249.00
FDA3B525	5.25"	259.00

Monitor bridge mounted hard disc with 3.5" floppy drive, floppy disc buffer card, SCSI card, PSU & cables

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HDA3BEX4535SC	45Mb	818.00
HDA3BEX8035SC	80Mb	1022.00
HDA3BEX10035SC	100Mb	1248.00
HDA3BEX20035SC	200Mb	1622.00

Monitor bridge mounted hard disc with 5.25" floppy drive, floppy disc buffer card, SCSI card, PSU & cables

HDA3BEX20525SC	20Mb	708.00
HDA3BEX45525C	45Mb	828.00
HDA3BEX80525SC	80Mb	1032.00
HDA3BEX100525SC	100Mb	1258.00
HDA3BEX200525SC	200Mb	1632.00

Monitor bridge mounted 60Mb tape streamer with hard disc, SCSI controller card & PSU

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HDTSA3BEX4560	45Mb	1715.00
HDTSA3BEX8060	80Mb	1919.00
HDTSA3BEX10060	100Mb	2145.00
HDTSA3BEX20060	200Mb	2519.00

Monitor bridge mounted 150Mb tape streamer with hard disc, SCSI controller card & PSU

HDTSA3BEX20150	20Mb	1849.00
HDTSA3BEX45150	45Mb	1969.00
HDTSA3BEX80150	80Mb	2173.00
HDTSA3BEX100150	100Mb	2399.00
HDTSA3BEX200150	200Mb	2773.00

Monitor bridge mounted 60Mb cassette streamer with hard disc, SCSI controller card & PSU

HDCSA3BEX2060	20Mb	1390.00
HDCSA3BEX4560	45Mb	1510.00
HDCSA3BEX8060	80Mb	1714.00
HDCSA3BEX10060	100Mb	1880.00
HDCSA3BEX20060	200Mb	2314.00

Bridge unit with 42Mb removable hard disc, SCSI controller card & PSU

RDA3BEX42SC	42Mb	1220.00

ARCHIMEDES SOFTWARE

PDT - Parametric Design Tool	359.00
PDT - Upgrade PDT release 1 to 2	45.00
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WorraCAD - Risc OS 2D Draughting	75.00
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Worra Plotter - Plotter driver for !Draw	29.95
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Internal Hard Discs	10.00
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Software	1.00

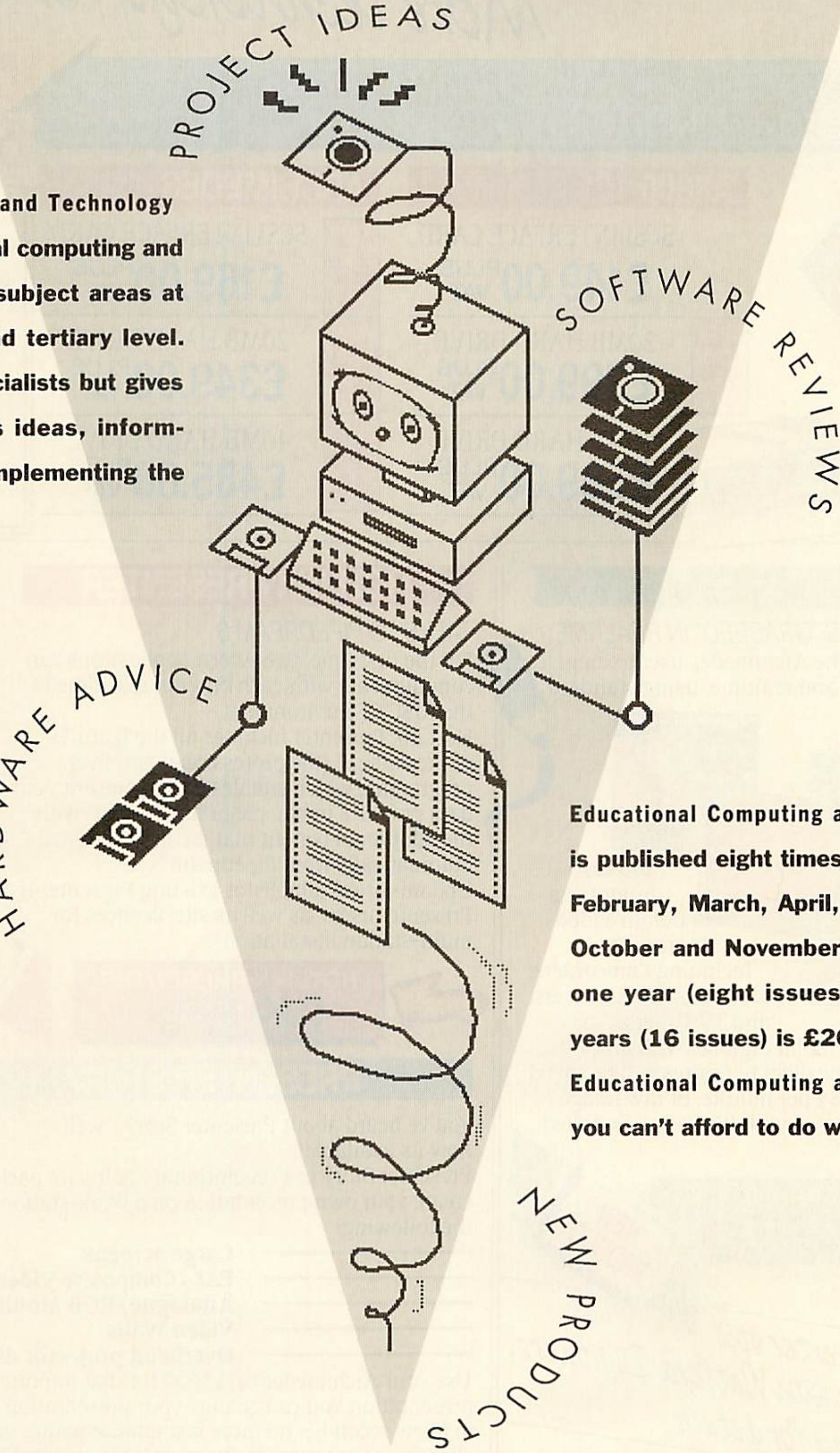
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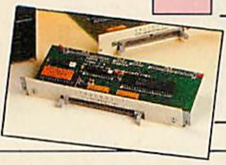
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You can input via a Colour Video Source (PAL), including Camcorders, Video Cassette Recorders, and TV Tuners.

Snapshot is a full 12 bit digitiser with an enhanced real-time display. Sprites can be saved at a rate of up to 84 per minute, or raw image data can be processed with !Enhance (supplied with package).

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NEW PRODUCT

Colour Converter still available for those with Watford Digitisers. Ring for details

Contact your local dealer for further details about all Lingenuity Products.
In case of difficulty ring **(098 685) 477**

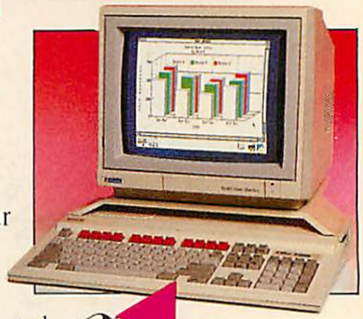
HOTLINK PRESENTER

TALKS TO PIPEDREAM 3

For the first time, two Acorn applications can communicate with each other in real-time in the RISC OS environment.

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Updates are available for existing Presenter II and Presenter users, as well as site-licences for multi-station installations.



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SPECIAL NEEDS SHOW

The Computers for Special Needs exhibition, organised by Northwest Semerc, took place at Oldham Civic Centre over three days in October.

On show was a wide range of products for all learners, including those with special needs. The emphasis was firmly on resources which can be matched to children's abilities, whether they are experiencing learning difficulties or not.

The major educational hardware manufacturers were present, as were companies producing other aids and software allowing access to IT for children who have communication difficulties or a hearing or visual impairment.

A number of LEAs also had stands displaying work from local schools. One of the most colourful was from Ashtons Green School in St Helens, a primary school for children with severe and profound multiple learning difficulties.

Readers who are interested in special needs education may like to know about SEND, a database containing 4000 pages of information on the use of IT for learners with special educational needs. It is available through Campus 2000 or via Prestel and carries data on relevant hardware, software, publications and conferences. There are also noticeboard and mailbox facilities.

For further information contact Anne Lavelle, SEND Project Manager, SCET, Dowanhill, 74 Victoria Crescent Road, Glasgow G12 9JN.



This year's successful Computers for Special Needs exhibition was well attended by teachers, advisers and students from all over the country. Here a visitor tries out a package called The Very Hungry Caterpillar. Based on the book by Eric Carle, it takes users through the life cycle of a butterfly. It is published by Northwest Semerc, also responsible for organising the show.

BETT SEMINARS

The build up to BETT is now well and truly underway and details of the free seminar programme have been released. Its theme is technology across the curriculum.

Working closely with subject teacher associations, speakers and topics complement the main exhibition. On the opening morning of the show, Wednesday 16 January, members of the Geography Association's IT working group will talk about planning and using IT in geographical enquiries and fieldwork.

The afternoon slot will be filled by the National Association for the Teaching of English. The focus is the relationship between language, learning and IT as a tool in the classroom.

The National Association of Head Teachers takes over on Thursday morning to discuss resources in education and the schools' relationships with governing bodies.

The afternoon session is occupied by the Association for Language Learning with its views on IT in the language classroom of today and tomorrow. Friday 18 promises to be an interesting day as the National Association for Remedial Education and NCET are giving joint presentations on a comprehensive range of topics related to IT and special education. In particular they will be taking a look at new technology to support learners with physical, visual and hearing impairments.

On Saturday morning, the Association of Teachers of Mathematics will display a range of mathematical material, including interactive projects, software, investigative activities and challenges for visitors.

Finally, on Saturday afternoon, the Association for Science Education will consider the question 'Electricity in the primary school – is it science or is it design and technology?'

The seminars will take place on level 9 of the Barbican Centre. There are no advance booking facilities – first come, first served – but to obtain free tickets to BETT, contact EMAP Exhibitions at 12 Bedford Row, London WC1R 4DU.

Lisa Hughes

NEWS IN BRIEF

● The Special Needs User Group, dedicated to the positive use of computers by, and for, people with special needs, is based at 39 Eccleston Gardens, St Helens, WA10 3BJ.

● Technology in Support of the National Curriculum for Students with Severe Learning Difficulties is a resources pack, distributed on behalf of NCET by the Advisory Unit. Comprising a set of newsletter-style publications, each dealing with specific aspects of IT and special needs, the pack represents some examples of current thinking within the field. It costs £12 and is available from the Advisory Unit, Endymion Road, Hatfield, Herts AL10 8AU.

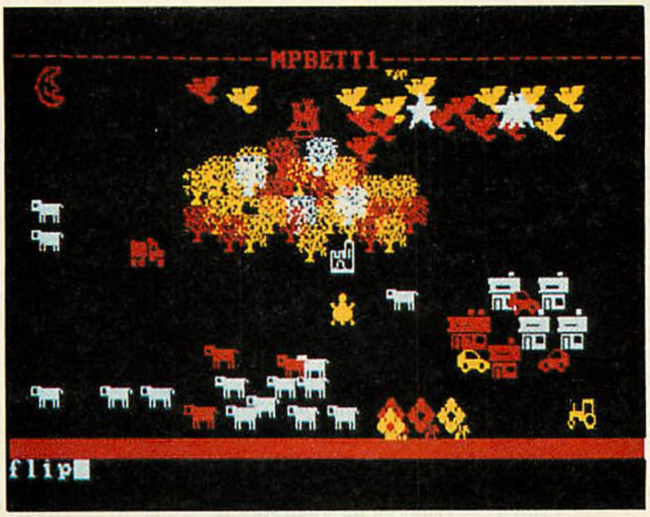
● The ACE Centres (in Oldham and Oxford) exist to help people with physical and communication disabilities benefit from technology.

The centres publish information sheets, surveys and occasional papers on topics such as introductory software, electronic communication aids, switches and interfaces and portable computers. The Northern ACE Centre is at Park Dean School, St Martins Road, Fitton Hill, Oldham OL8 2PY. The Southern ACE Centre is at Ormerod School, Waynflete Road, Headington, Oxford OX3 8DD.

● The IT/SEN team from Newcastle Polytechnic and Northern Micromedia are developing a series of resource packs called *Connections*. *Christmas Ideas* is the first. Although designed for children with learning and/or language difficulties, it is equally suitable for early primary pupils. It is based on *Touch Explorer Plus* overlay files and runs on the Beeb or Master with a Concept Keyboard.

Christmas Ideas and the subsequent packs are available from Northern Micromedia, Resources Centre, Coach Lane Campus, Newcastle upon Tyne NE7 7XA.

LEARN WITH LOGOWRITER



Graphics made easy with Logowriter

The educational claims made for Logo have always been stupendous. Through Logo, children can not only encounter elementary programming concepts, but they can also learn to program the computer rather than be programmed by it.

Seymour Papert, the intellectual 'father' of Logo, spoke of children being able to experience new ways of learning and thinking. But while the existence of Logo in schools and homes has not precipitated any discernible revolution, the enterprise has not been built on false hype.

One problem facing teachers has been providing a practical context for Logo work. After children have learned to draw a square, define a procedure or play around with word lists, what next?

Despite the amazing geometry that can be achieved with Logo, young learners often perceive it as a 'toy' language.

Books on the subject, such as Peter Goodyear's *Logo, a Guide to Learning through Programming* (Ellis Horwood 1984) or *Microworlds Adventures with Logo* (Hutchinson 1985), have not been able to change the popular perception of Logo purely in terms of turtle graphics.

Logowriter from Computer Systems Inc (LCSI) of Montreal, Canada may make all the difference. The chairman of LCSI is Seymour Papert himself and this 'second generation Logo' version 2.0 for the IBM PC works fine on the Master 512 – except for the music making facilities, of course. There is no way around that particular hardware limitation. Under the PC emulator on the Archimedes, *Logowriter* runs twice as fast as Logotron Logo on the model B.

The most important difference between basic Logo and *Logowriter* is that the crude text editor of the former has been replaced by a wordprocessor. Indeed, it is likely that the user will think of *Logowriter* as a wordprocessor that includes the Logo language, rather than the other way round.

The square at the top left is the text cursor, the turtle in the middle is the one we all know and below the screen divider is the command centre.

To write a letter, HT is typed (Hide Turtle) and then CTRL-U to move the active cursor from the command centre to the main work area. Use the junior wordprocessor and when the letter is finished, CTRL-D returns the user to the command centre where typing printtext does exactly that.

LOGO MAGIC

The magic of the Logo language is that it is something the student utilises as and when necessary. Direct control of the turtle, or any one of the 25 different shapes it can assume – eg, a car, moon, star, face, helicopter – is available from the command centre so the geometry skills merge with letter writing ones.

Programs and subroutines are created on an alternative screen called the Flip Side (CTRL-F) and can then be accessed from the main command screen. Suddenly Logo is not a toy anymore, but a sophisticated computer language that can enhance a piece of writing.

Typing printscreen will print the Logo graphics as well as any text. The wordprocessing facilities include cut, copy and paste functions as well as a truly excellent macro facility.

Type WHEN "A [PR Redwood Publishing, a BBC Enterprise Company, 20-26 Brunswick Place, London N1 6DJ]. Then, whenever CTRL-A is pressed, the full address will automatically appear.

Logowriter has four turtles that move across the screen, on their own or in synchronisation, and the turtles themselves can be edited to any shape within a 16 x 16 pixel size limit, as can the 25 other shapes that the turtles can assume.

Think of the flash and glitter effects possible with Logo and the potential for motivating students to appreciate Logo is obvious.

Keep up to date with Logo news by reading Logos *from the British Logo User Group (BLUG), PO Box 43, Houghton-on-the Hill, Leicester LE7 9GX. Tel: (0533) 433879*

USEFUL HINTS

● Master 512 users will have to play around with the software a bit. The Home Edition that I was working on had a LOGOWR.COM file which called up the main program and everything worked until I started printing.

The printtext command was no problem, but the printscreen command produced a thin blank line between text and graphics on an Epson printer. An examination of the files revealed various files with the DRV extension to their names as well as various batch files. Typing cgaeps1.bat at a>, with a blank Dos bootable formatted disc in the b drive (created from the disc program on the *Dos Plus* disc) causes things to start happening.

A new autoexec.bat file will be created on the new disc and the relevant program files copied over, including the Epson driver. Using the new disc will print text and graphics without the blank line, and the whole program will load automatically after the *Config.tube command.

● A new addition to Logo is the built-in support for the Concept Keyboard. This works with new low C/C via the serial port.

● *Logowriter* can be ordered from the UK agent of LCSI by writing to Mike Doyle of 37 Bright Street, Skipton, North Yorks BD23 1QQ. The Home Edition, which consists of the software and basic guides, costs £64. School packs (primary/intermediate/secondary) include activity cards, project books, teachers' guide, reference guide, keyboard poster and stickers. The cost for one set is £108. Contact the agent for full details of site licenses and multiple packs.

● Incidentally, a bug has been reported in *Logowriter:* stamping multiple shapes on one page can eventually cause this function to go into hibernation. Starting a new page brings it back to life.

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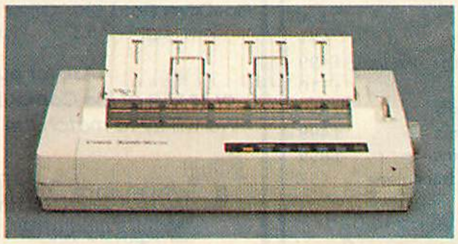
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STATE YOUR ANSWER

I understand that more software for the A3000 is readily available in the USA than in the UK. Do you have names and addresses of companies I could approach for the purchase of the software? Alternatively, is there a company in the UK importing this software?

Mrs Hilary Mobbs
Leeds

It seems you have been confused. Commodore has a machine in the USA called the Amiga 3000, or A3000 for short. This has nothing to do with the BBC A3000 or software available for it.

RS232 SEARCH

I have been the proud owner of a Master Compact for a number of years. The machine has worked hard and faithfully for me without failure.

Recently I decided to purchase some 'goodies' for the machine – an RS232 kit and a hard disc unit, as featured in Acorn's own software applications catalogue.

I went to my local dealer requesting said items, but was told they would not know where to find them. I telephoned Acorn which told me that the RS232 was available and that the dealer should order it. As for the hard disc, I was told such a unit was not available for the Compact.

I then telephoned 10 dealers about the RS232, but only one was prepared to order it – and I'm still waiting for it!

I was a convert to Acorn both for personal and professional computing, but I am seriously looking at purchasing a PC instead of an Arc because of such service difficulties.

Graham Alexander
Birmingham

If any dealer would like to help this reader out then let us know and we will pass details on.

UNFAIR SURVEY?

The recent *BAU* reader survey, which included an ideas competition was, in my opinion, unfair. In last month's issue it was stated that there was only one winner and that ideas from readers would be used in future issues. Why then only give one prize?

Surely *BAU* should have given prizes to all of those who sent in ideas which were worthy of an article. Instead of one large prize, there could be several software prizes.

No, I'm not a sore loser, I believe that if ideas are worthy of an article then they are worthy of a prize. If not, then *BAU* is taking good ideas and making a profit from them without acknowledging their origin or rewarding their originators.

Linda Bailey
Kirkby

The point of any survey is to ask readers what they would like to see in a magazine. This should result in an improved product from which readers will benefit. The response levels are usually higher if a large prize is involved, but we will consider other, smaller prizes, next time. Meanwhile, many readers will benefit directly if we publish some of the program ideas given to us – hardly unfair.



The A3000 is not in the USA yet

DREAM AWAY

In the October letters page Mr Totham asks about the *Pipedream* caret being a thin red line which he has difficulty seeing.

To address this problem, which is common to all Risc OS desktop editing programs, we have enabled the user to change the colour of the caret as well as text foreground and background colours. We have also highlighted the border of both the row and column which helps in locating the caret. The last of these changes was made in version 3.10 and users are welcome to a free upgrade by sending us their master disc and a stamped addressed envelope.

Robert Macmillan
Colton Software

INTO INTERWORD

My original use of *Interword* was on my BBC so when I upgraded to an Archimedes, I transferred all my old files.

Some of the files I transferred loaded fine, but this wasn't the case for all of them. The machine would apparently crash each time I tried to display my text. Pressing ESCAPE to get back to the menu resulted in an unusable display and the menu was printed all in one column.

I later discovered that the problem only occurred where text had been saved in 106 character mode, with the Arc version using 132 column mode. By perseverance I found that if I loaded the text, went to the preferences menu and then pressed the right arrow key, '40 spooled text' would appear, successive presses would produce '80 spooled text', and so on.

Pressing ESCAPE displayed all text as it should be and re-entering the preferences menu was normal.

I hope this helps other *Interword* users out there.

R Wallis
Crawley

HELPING HAND

About 18 months ago my makeshift computer desk fell apart. A new desk I was given had metal legs – unfortunately, if I touched the legs with anything metal on my electric wheelchair, a charge of static electricity damaged chips in my Arc 310 machine.

One of Acorn's engineers modified the board in the machine, fitting it with the same diodes used on the 440 series. In the meantime, the company loaned me a 440 and two hard drives while I was writing a program.

During a visit to the *BBC Acorn User* show, a man came up to me and said: 'Hello, I'm Sam Wauchope (Acorn's MD). You wrote me a letter asking if I could extend the loan of our machine. You can keep the machine, as long as whenever you write a program, you send me a copy!'

The only problem with this machine was that the sound chip had gone, so Acorn had the machine back and had it driven back to me direct.

All concerned have been so kind – Acorn is even looking into the possibility of my visiting the company.

If I was to mention everyone by name, this letter would be twice as long, so I would just like to say a big thank you to Acorn and all other friends and colleagues, including David Clare.

Tim Richings
Cornwall

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A3K3

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A3K6

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A selection of problems from our Post A Problem service



QUESTIONS AND ANSWERS

Q I am thinking of purchasing the BBC A3000 Learning Curve, which I hear has an emulator that enables it to run IBM PC software with MS-Dos or DR-Dos as the operating system. At work there are PCs that use 1.2Mb discs. Will I be able to use this format on the A3000?

Tony Chilton
Hanwell

A Unfortunately, the A3000 with Acorn's PC emulator cannot cope with 1.2Mb discs. This is due to the floppy disc controller not being able to perform at the level required.

Q I saw an announcement somewhere that BBC A3000 owners can, by a software fix, support 'Windows' EGA graphics standards. Is this true?

Steve Buttery
Australia

A Acorn states that current versions of the PC emulator (1.33 and the newer 1.34 supplied with the A3000 Learning Curve provide an emulation of the 4.77MHz 8088-based IBM PC. This means that the Acorn PC emulator will emulate 'basic' PCs or clones like the Amstrad PC1512, which I understand can run versions of 'Windows'. Unfortunately the 'announcement' you refer to is incorrect. We are not aware of any Acorn or third party fix.

The Acorn PC emulator will support the CGA standard with the usual Acorn colour monitor. Any programs that use the EGA, VGA, Super VGA or the Hercules Graphics Card will not normally run. It must be noted that with the right software it would be possible using a multisync monitor running in an appropriate mode for VGA. With the Arm3 installed, Super-VGA could also be emulated.

Q I have an A3000 which I use with a Canon PW-1080A printer. When I use these with *First Word Plus* I am unable to print the graphics I have imported into the text. I seem to have no difficulty with normal text. Can you help?

Angela Craggs
York

A The problems you are experiencing are probably due to an incorrect printer driver. I suspect you are using an Epson FX or another Epson driver supplied with the package. The Canon PW-1080A printer is not totally Epson-compatible, and that is the problem when printing graphics.

I suggest you purchase a Shareware disc of *First Word Plus* printer drivers from Norwich Computer Services, which advertises in *BAU*. The disc costs about £3.50 and contains lots of different drivers and includes one suitable for your printer. I suggest when you order you check this with Paul Beverley.

Q I am confused about the priority of the Rom sockets in the BBC model B. Can you explain which is the socket that has the highest priority and its actual location?

A Faulkner
Macclesfield

A The highest priority socket in an unexpanded model B is socket 15, which is the one furthest away from the Mos which should be located in IC51. Socket 15 is normally marked IC101.

Q I am interested in writing some Rom software of my own to run on a BBC model B or BBC Master 128. I cannot seem to find any books that specialise in this area of BBC hardware. Are there any?

Toby Isaacs
Tywford

A There are two books that I recommend you consult, both written by Bruce Smith. The first is *The BBC micro Rom Book – sideways Roms and Rams* (published by Collins, ISBN 0 00 3830756, price £9.95) and the second is *The Advanced Sideways Ram User Guide for the Master and BBC Computers* (published by Victory Publishing, ISBN 0 948938 00 5, available from Dabs Press at £9.95).

Q I have a BBC Master 128 with an 80-track disc drive. Unfortunately I have been experiencing some problems with various brand new BBC Soft educational programs. One of them is *Spelling It Out*. When I run the program I get the message 'Disc fault 18 at :0 11/07'.

Ian McNellan
Hartshill

A The *Spelling It Out* disc is supplied in BBC DFS 40-track format. If you have 80-track drives and you try to load and run *Spelling It Out* you will get this message.

If you have a problem with an Acorn micro, commercial software or a program you are trying to write then *BBC Acorn User* can help. The Post A Problem service guarantees to give you a personal answer within 10 working days for just £4.

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Please note that debugging readers' own programs or those from other magazines is a complex task and we cannot guarantee to give a full solution. Unless the problem can be spotted quickly, the Post A Problem service will only be able to make general comments. The service will answer the problem and return all material received within 10 working days of receipt. If we fail to match this promise then your cheque or postal order will be returned – you can't lose!

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This is because the disc was supplied in 40-track format. You will have to convert the disc to run on 80-track disc so that it runs on your Master 128 system.

Q I have an Archimedes 310 which I would like to use to establish a graphics system using a secondhand mono close circuit video camera, VCR and a digitiser. Is it possible to set up a system that will allow me to use the camera equipment in mono and the VCR in colour?

Max Palmer
Rutland

A I think your problem will be solved by purchasing the Watford Digitiser and the Colour Convertor add-on produced by Lingenuity, of Wood Farm, Linstead, Magna, Halesworth, Suffolk, IP9 0DU. This hardware card with software will capture full colour images using the monochrome Watford Digitiser and colour video equipment. It costs £170.

Q My BBC Master 128, has been fitted with the new Acorn mega system Rom. It has two disc drives, one is 5.25in and the other 3.5in. But I am having problems using the 3.5in drive, which will not load or save programs. I have had the drive checked and it's not faulty. Have you any ideas?

Dr Michael Taylor
Worcester

A The problem is likely to be the configuration you have set for the head stepping and its settlement time. It is obviously OK for drives 0 and 2, but problematic for drives 1 and 3.

You need to look at the drive control parameters which are set by the FDRIVE command. This option allows the user to make adjustments to the way the discs are controlled.

The value is a decimal representation of a sequence of binary digits (bits), each of which is used to indicate a particular setting, further details of which will be found in the technical documentation for your disc drive unit.

On the older BBC model B the *FX255 command followed by 0 and either 207, 223, 239, or 255 controlled the step and settlement time. This *FX command is still available with the Master 128 but normally the *CONFIGURE FDRIVE (n) is used.

The default setting is normally 3 and appropriate to the most commonly available disc drive units. I suggest you experiment with the setting between 1 and 7.

Q My Archimedes 410/1 has a 5.25in disc drive connected via a suitable interface from Watford Electronics. I am experiencing problems in getting the drive to read discs in IBM 360K format. Can the Arc do this when running under the PC emulator?

G C Townsend
Watford

A The MS-Dos operating system which runs when you are using the Acorn PC emulator expects to read and write IBM 720K format discs.

You will have to enter the following 'fix' into your config.sys file:

drivparm=/d:1 /f:0

This line is inserted as described in the PC emulator manual for configuring a Ram drive. It tells MS-Dos that drive B only has 360K capacity.

After rebooting the system, the command FORMAT B:. will produce a 360K disc.

Q I'm looking for a BBC A3000 application that I can use to present business graphics. What is available?

J Ainley
Reading

A There are two possibilities. *Presenter II* from Lingenuity and *Graphbox* from Minerva.

***Presenter II* costs £39.95 and offers four graph types – bar chart, line graph, pie chart, and scattergram, while *Graphbox* offers 20 different forms of graph display but at twice the price.**

ACORN CUSTOMER HOTLINE

Computers based on Risc technology are very powerful and can emulate computers based on different microprocessors such as the BBC model B and IBM PC. This allows the Archimedes and BBC A3000 to run a huge range of software that was not specifically written for them.

A number of people are confused as to what the PC emulator provides for the user. The Acornsoft PC emulator is provided as a two-disc package, one with the emulator program and one with Microsoft's MS-Dos operating system for IBM PCs. The PC emulator software transforms the Archimedes into a PC complete with a colour graphics adaptor (CGA) display and 720K PC format 3.5inch disc drive, and up to 640K of memory. Unlike Risc OS computers whose operating system largely resides on Roms within the computer, MS-Dos machines must load their operating system from disc. For this reason starting the PC emulator is a two-stage process requiring both discs. Once it is running, the machine can run a huge range of PC software. If the computer has a hard disc then part of this can be partitioned for use by the PC emulator. The emulator provides MS-Dos utilities that allow the exchange of data between MS-Dos and ADFS discs and there are third party utilities that allow MS-Dos discs to be read from Risc OS.

● What is SID? This is a question we are asked many times every day. For the benefit of people who are not sure I will explain. SID is Acorn's Support Information Database. The service is available to any user who has a modem connected to their computer. SID offers many facilities including:

- ■ Acorn product information
- ■ Application notes on many different topics (downloadable)
- ■ Telesoftware Library including software supplied by *BBC Acorn User*, plus Acorn applications such as those described in the October issue of *BAU*.
- ■ A section called 'El Sid' which has areas like Language Forum, Risc OS Forum, book reviews, software reviews, education column, graphics column and many more.
- ■ Technical mailboxes to send questions about Acorn products.
- ■ Bulletin boards to glean information from other users. Acorn staff also put up answers to questions asked in these areas if they are able to help.

To find out more about SID, try the guest system on (0223) 243642. You will need viewdata terminal software set to 1200 baud receive, 75 baud transmit, seven data bits and even parity.

● Please remember that Acorn's Customer Services department are unable to deal with technical enquiries via the telephone. If you need to make a technical enquiry regarding one of Acorn's products and your local dealer is unable to help, please write giving full details of your system and the problem you have experienced. This will enable us to deal with the enquiries effectively. To ensure mail reaches us, make sure you use the correct address: Customer Support, Acorn Computers Limited, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN.

● You can still upgrade to version 2.1 of *Dos Plus*. If you own a Master 512 please check which version of the system software you are using (by running *Dos Plus*) and if the version is earlier than 2.1, return your original four discs to the above address for a free upgrade. This upgrade will not be available forever so you should get it now while stocks last.

You can also obtain application notes on various aspects of the Master 512. These include details on software compatibility, plus essential hints and tips on general usage of the Master 512 expansion.

Archimedes memory upgrades

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The bare board has sockets on it, but no RAM chips. This is for the benefit of those who wish to obtain RAMs independently. Suitable devices are 256K by 4 bit (eg 514256), and 1M by 4 bit (type 514400), ZIP package. Eight chips needed in both cases.

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*The price of RAM is constantly varying, so phone for the latest situation.

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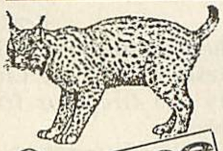
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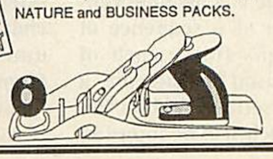
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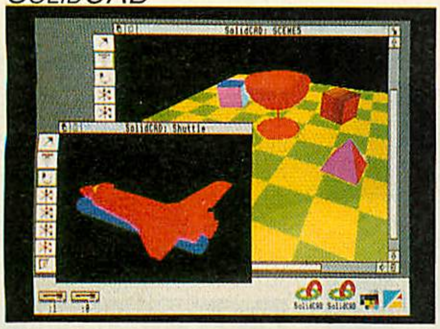




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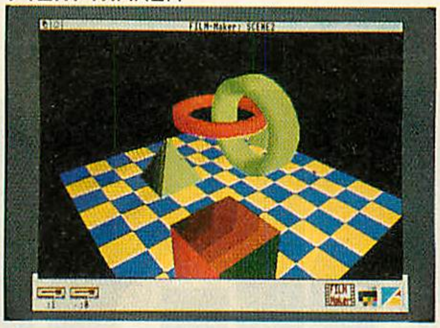
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(RISC OS) New

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(RISC OS) New

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(RISC OS) New

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(RISC OS) New

RiscBASIC

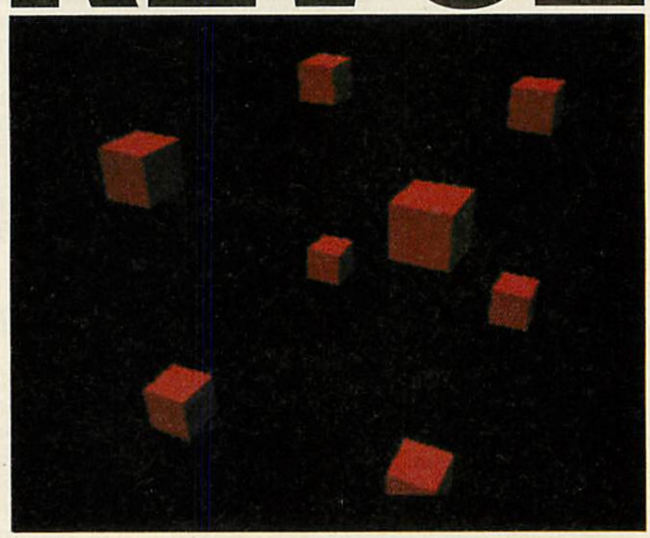
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For all Archimedes and A3000 owners, **DAVE ACTON** has compiled

RISC REVUE



£15 COMPUTER CUBISM

This month's opener involves 3D animation from **James Gallagher**. It's a short and simple demo and should provide some good pointers for those experimenting with 3D plotting techniques. It also illustrates a couple of nice features of Archimedes Basic V. The program is listing 1 on the yellow pages – just type it in and RUN.

The program simply builds up a sequence of frames, storing each as a set of quadrilaterals in the array img_data%(). These are replayed at the end by PROCanimate.

Mode 13 is used and the program swaps between two screen banks for smooth animation, so 160K of screen memory is required. You can use mode 15 instead, but this will be slower and 320K of screen memory will be needed.

The cubes are correctly shaded according to a specific light source and the position of this is set at lines 130 and 140.

All co-ordinates which are used within the program are of x,y,z format where the z-axis is vertical, the x-axis is perpendicular to the screen plane and the y-axis is horizontal in the screen plane. You might like to try moving the light source during the animation, in which case you should set light_from() and light_to() within the main animation loop, which runs from line 190 to 630.

Animation is performed within a simple FOR...NEXT loop. The parameter param% determines the particular stage of animation.

In this example param% is divided by 90 and the resulting value of 0 to 4 is used in a CASE statement to specify one of five types of animation . . . hence the cubes merge and rotate and so on.

Two procedures, PROC-createbox and PROCdisplaybox, are at the heart of the program. PROCcreatebox takes 10 parameters (summarised in the table opposite). PROCdisplaybox takes just two parameters – the array in which the box is stored and the colour to be used. This can be red, green, blue, yellow, cyan, magenta or white.

The viewing position (stored in viewfrom() and viewto()) can be changed, but if ever this is done the procedure PROCorientate_scene should be called immediately.

One nice short-cut of Basic V is provided when it comes to initialising arrays. In older versions of Basic, something like this would be required:

```
DIM a(2)
a(0)=10
a(1)=20
a(2)=30
```

but in Basic V these last three lines can be replaced with the single line:

```
a()=10,20,30
```

£5 LOGAN'S LOG

Thanks to **Dr Ian Logan** who has shed some light on A F Reysenbach's power-calculating program (*BAU* September). You may remember that a very small fraction was needed to prevent inaccuracies. Ian points out that:

```
PRINT INT LOG 1000
```

produces the answer 2 rather than 3. Setting @% to display sufficient decimal places reveals that Basic's LOG function actually thinks that LOG 1000=2.99999999 and the INT rounds this down. For those of a mathematical persuasion, Ian has included a short Basic program which calculates logs in the same way as Archimedes Basic (listing 2 on the yellow pages). By altering the value of log_exp_1 to 0.43429448194 the inaccuracies revealed by Mr Reysenbach can be cured and this has much the same effect as the additional 0.000000002 in that original program.

£10 STRETCHING A POINT

Two readers have sent in additions to the *Stretch* application (*BAU* September). If you remember, Chris Ruseman's program allowed *!Draw* files to be stretched to fit arbitrary quadrilaterals.

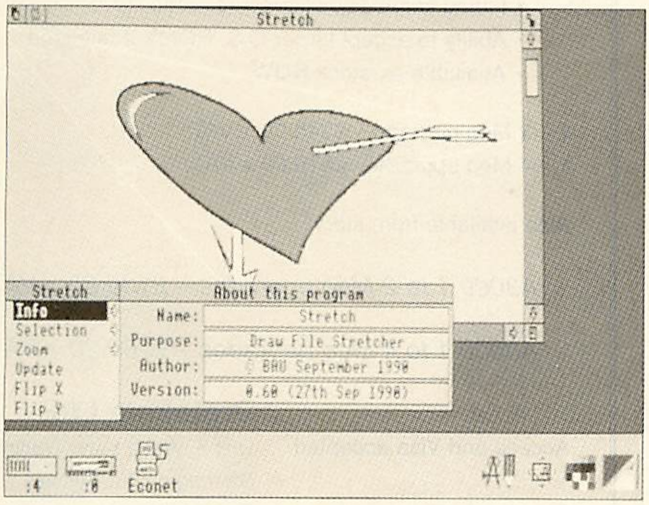
The first set of amendments comes from **William Pargeter** of Hitchin and provides options for reflecting an image about the x and y axes (listing 3 on the yellow pages). Make a copy of *!RunImage* in the original *Stretch* and then add the lines of listing 3. Then resave as *!RunImage*.

The main menu is altered so the two new options are included on the bottom. Two lines are added to PROCpreparemenus to dim out the options if no object is currently selected and another two lines are added to PROCdecodemainmenu so that the new procedures, PROCflip_x and PROCflip_y, are invoked correctly.

These are then added to the end of the program with line numbers of 10100 onwards.

Tony Patterson of Cheltenham has also sent in some additions (listing 4 on the yellow pages). Having updated *!RunImage*, four new drag boxes are provided when an object is selected, situated midway along each side. Pulling these with the adjust button causes the particular side to move as a whole. Tony points out that this is particularly useful for italicising and lateral or longitudinal stretching.

I spoke to Chris Ruseman himself at his Northumberland home and he too offers a few additional lines to cure a couple of occasional problems (listing 5 on the yellow pages). Line 1780 checks for too many draw-



files being loaded direct from *!Draw*. Lines 4931 and 4932 check to see if an object deposited on *Stretch* is outside the visible area. This can happen when they are dragged onto the *Stretch* icon on the icon bar. In such cases, the object will appear in the bottom left corner of the *Stretch* window.

Finally, line 570 updates the version number to 0.60.

Chris tells us that when he finds time he hopes to produce a new, speedier version of *Stretch*. Any suggestions for new features are very welcome, so he says. Send them either to this column or to Chris care of *BBC Acorn User*.

The three sets of new lines can be added at once if you like, but do remember to keep a copy of the original *!RunImage* just in case.

£10 BIRDS OF A FEATHER

This next offering comes from **Jonathan Lynch** of Doncaster and demonstrates the idea of 'flocking', much in vogue in the higher echelons of computer graphics (listing 6 on the yellow pages).

The program uses two screen banks and runs in mode 9 – the mode 13 command at the start is simply a short way of clearing both screens.

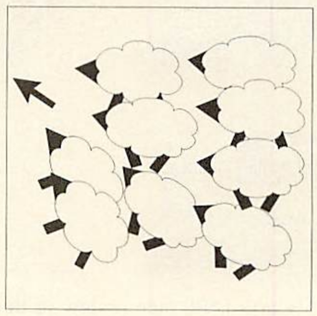
When run, a flock of little birds/bees/fish all rush to the pointer. Move the pointer and they will follow, but some are quicker than others and some will take a meandering path whereas others will fly/swim directly. The result is a surprisingly 'natural' effect.

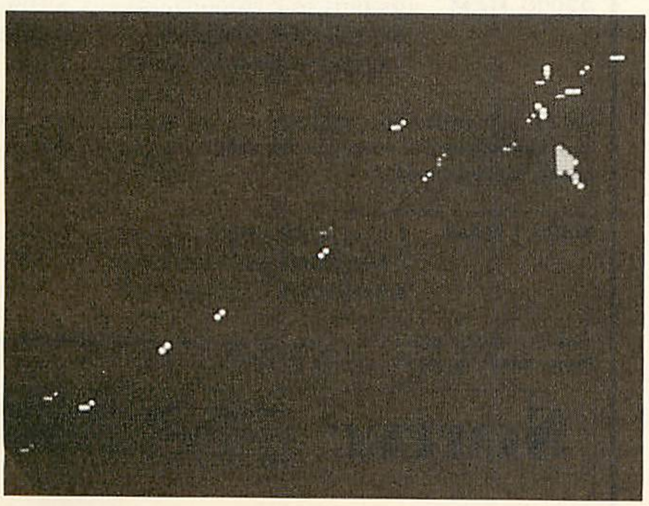
The data for the animals is stored in several arrays. x() and y() contain the positions, xv() and yv() the velocities and xa() and ya() the accelerations. The array ck() is the 'catch-up constant' and is related to the strength of the individual animal. The larger the value, the quicker it can catch up with the mouse pointer.

The 'randomness' of each animal is stored in r(). A high value means that the animal will follow a crooked path whereas a value of 0 will ensure a direct route.

To increase the number of animals alter the value of n%. The other variable you might like to play with is d which is the 'damping' factor.

A value of one will cause the animals to perform simple harmonic motion about the pointer. A value of less than one should be used so the animals ultimately come to rest.





Jonathan thinks the creatures currently look like a swarm of bees but is sure herds of buffalo, flocks of sheep and even schools of whales can be emulated. If you come up with any interesting variations, please send them to Risc Revue at the usual address.

£5 SCREENSAVE UPDATE

You may recall there was a problem with the screen-saver (April's Risc Revue) when used with multisync monitors. Well, **Andy Meechan** of Poole has supplied us with a fix. The following lines should be changed/added:

```
550 EQUD &700
1291 ADD R0,R0,#256
1660 MOV R0,#&300
```

Parameter	Meaning
1	the array in which the box data is to be stored
2,3,4	the x,y,z co-ordi nates of the box centre
5,6,7	length, width & height of box
8,9,10	amount box is ro tated about x, y and z axes (in degrees)

PROCcreatebox parameters

With these alterations the screen saver works fine on Andy's 440 with a Taxan 770+. The basic idea is to set MEMC to 'continuous refresh' mode.

There is not normally any DRAM refresh generated in hi-res modes so disabling DMAs means that without the modifications above, the Ram is simply left to die!

£5 CLICK TIP

A good tip here for users with special needs and others who have trouble with double-clicking. It comes from **Alan Gibson** of Fife. Simply hold down either Select or Adjust (depending on the sort of double-click you want to do) on an unused area of the desktop. Then, still holding the button down, move the pointer over the object you want to double-click and press the menu button. Pressing and releasing the menu button has the effect of clicking twice with whichever other button you are holding down.

Alan also points out that this technique can be used as a quick way of loading several files at once. Just hold down Select and click on each file with Menu.

DO YOUR BIT...

Please send all your programs, ideas, hints and tips to: Risc Revue, BBC Acorn User *Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ. Don't be shy – share your ideas with other* BAU *readers*

NEXT MONTH Coming soon to BAU...

FIRST STEPS



The January issue should help the Christmas festivities with no less than two big-prize competitions and a great new series for newcomers to the A3000.

Designed to run over the next year, the series will take you through from unpacking the box to programming your own software. And, if you don't happen to have an A3000 yet, there is a chance to win one. We're giving away a super Jet Set package, which includes the machine and lots of free software.

Meanwhile, for owners of Superior Software's *Exile*, this is the moment you've been waiting for. We have the solution mapped out.

You couldn't wish for a better Christmas present than the new Taxan 795 colour monitor worth £500 (see review in this issue). Enter our super colour graphics competition and get 1991 off to a colourful start.

There's also has a taster for our superb new game for all Beeb users. We give you a 'head' start next month.

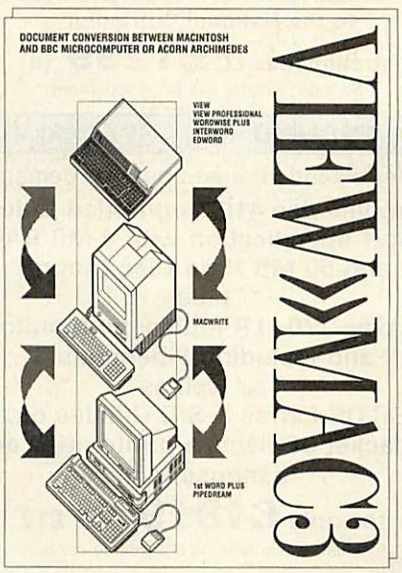
If you've ever wondered how (and why) demos are produced, January's issue has the answers.

On the review front we will be looking at *Flexifile* from Minerva and the *Tabs* 3D modelling package from Tap Consortium. We will be sky gazing with Eiffel's Weather Station package and testing some upgrade options for your Archimedes and Master 512.

All this and the latest news and games gossip. Don't miss January's *BAU*.

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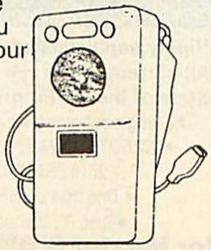
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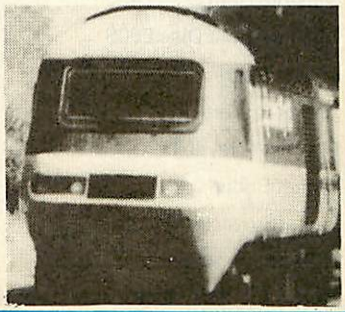
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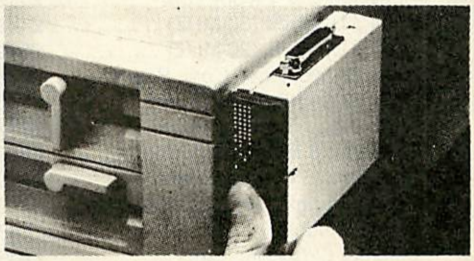
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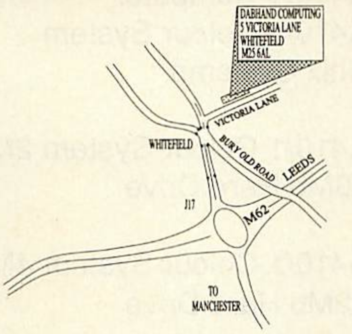
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Archimedes Operating System	£14.95
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Watford Electronics

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Archimedes micro

System	Basic	Mono	Colour	Multiscan
410/1	£1099	£1159	£1288	£1448
420/1	£1299	£1359	£1488	£1648
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Archimedes A3000

12 MONTHS FREE MAINTENANCE ON SITE

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- A3000 + Learning Curve pack £699
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- Monitor Stand £16
- External Podule Case £13
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- User port/MIDI upgrade £45

Unbeatable Sale Offers on Archimedes Micro

(Extended by Popular Demand)

When you purchase an Archimedes Micro from Watford, look what you get FREE with it

Micro	Free Offer
A410/1	Upgraded to 2MB RAM & a 20MB Hard Disc, (A420)
A420/1	Upgraded to 4MB RAM 40MB Hard Disc (A440), MK II Learning Curve pack and Acorn DTP pack
A440/1	Upgraded to 4MB RAM 40MB Hard Disc (A440), MK II Learning Curve pack and Acorn DTP pack
540/1	High Res Multiscan Monitor & Panasonic KX-P1180 Printer
A3000	Upgraded to 2MB RAM on board

+ 12 months FREE On-Site Maintenance

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- 2 Podule Backplane £25
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- Fan for above backplanes £8
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- **R810** – A410/1 upgraded to 8MB £910
- **R820** – A420/1 upgraded to 8MB £859
- **R840** – A440/1 upgraded to 8MB £749
- **R814** – R140 upgraded to 8MB £749

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Increase the speed of your Archimedes by a factor of THREE to SIX times (depending on the software you are running), with Watford's ARM3 Upgrades.

- **ARM-3** 20MHz Upgrade Board £349
- **ARM-3** 30MHz Upgrade Board £399
- **MEMC** 1A Upgrade £49

(Special Offer – If purchased together with an Archimedes Micro, then not only will we fit the card Free of Charge but we will also reduce the price by £60 i.e. You pay only £289 for ARM3 20MHZ & £339 for ARM3-30MHz)

Convert your Archi 410 to a 420 or 440 with Watford's unique Upgrade Kits

- **UP10** – to 2MB RAM + 20MB Hard Disc £229
- **UP15** – to 2MB RAM + 40MB Hard Disc £334
- **UP20** – to 4MB RAM + 20MB Hard Disc £335
- **UP30** – to 4MB RAM + 40MB Hard Disc £445
- **UP40** – to 4MB RAM + 53MB Hard Disc £515

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All our memory upgrades are simple to fit. No soldering required. Fitting instructions supplied.

- **R302**-A3000 – to 2MB RAM Upgrade £65
- **R304**-A3000 – to 4MB RAM Upgrade £179
- **R311**-A305 – to 1MB RAM Upgrade £99
- **R312**-A305/310 – to 2MB RAM Upgrade £245
- **R314**-A305/310 – to 4MB RAM Upgrade £435
- **R412**-A410/1 – to 2MB RAM Upgrade £65
- **R413**-A420/1 – to 4MB RAM Upgrade £120
- **R414**-A410/1 – to 4MB RAM Upgrade £173

Archimedes Hard Disc

Watford's Hard disc drives for A310 & A410 series fit internally into the space provided. The 'simple to follow' fitting instructions supplied makes drive fitting very easy. All disc drives are self parking. 40Meg & 53Meg drives are fast 24mS type, while 20MHz are 28mS.
P.S. A310 upgrades require a backplane and a fan.

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- **3HD20** – 20Meg H' Disc + Podule for 310 £299
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- **3HD50** – 53Meg H' Disc + Podule for 310 £474
- **4HD20** – 20Meg Hard Disc for 410 £169
- **4HD40** – 40Meg Hard Disc for 410 £269
- **4HD50** – 53Meg Hard Disc for 410 £399
- A3000 20Meg Hard Disc + Podule £359
- A3000 40Meg Hard Disc + Podule £489

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Super Plot	£20	Solid Tools	£199
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- Risc Os Extras Software Disc £5
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- Ethernet Card £220
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- Impression 2 DTP Pack £165
- Impression Junior £79
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Image Writer	£25	View	£45
Interword Disc	£24	Viewindex	£12
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Graphics, Art, Design & Games

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ISO-PASCAL; FORTRAN 77			£77 each
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RISC BASIC	£85	BASIC Compiler	£77

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Ancestry	£59	Mailshot*	£29
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System Delta + Reference Manual			£25
Order Processing/Invoicing*			£53
School Administrator			£118

** Requires System Delta*

NEW Business Accounts Packages
Nominal Ledger, Order Processing/Invoicing, Purchase Ledger, Sales Ledger & Stock Control
Price: **£85** per Module or
£325 for complete package

ULTIMUM – Archimedes A3000 Podule Racking System



THE ONLY LOGICAL WAY TO EXPAND YOUR A3000 COMPUTER

The accepted standard for Archimedes computer expansion is the Acorn Podule, designed initially to fit the old 310, and also for the later A400 and A400/1 series micros. The podules fit inside these computers up to four at a time. The A3000 is the little brother of the family, but can only have one podule at a time, plugging into the back of the computer.

Other attempts have been made to expand the A3000 by trying to introduce a 'mini-podule'. This is impractical for many reasons, amongst which is the reluctance of manufacturers to produce them. Nobody wants to re-design podules already produced. Some cannot be produced on a 'mini-podule' as they are far too complicated and simply wouldn't fit.

Watford Electronics listens to the demands and requirements of its customers, and we are glad to say that we have come up with the only real solution to the A3000 expansion problem. The ULTIMUM Podule Racking System allows up to three FULL SIZE standard Archimedes 300/400 series podules to be fitted to the computer. In addition, there is also provision for a hard disc drive and a podule to be fitted internally.

Since the ULTIMUM Podule Racking System takes proper full size podules, you will be able to use any of the currently available peripheral equipment, from companies like Computer Concepts, Armadillo, Acorn and of course, our own brand.

Fitting the podules to 'ULTIMUM' is simple. They are neatly fitted inside the metal case of the rack, avoiding the previously untidy method of hanging the podule off the back of the computer, risking damage to both, it and to the computer.

'ULTIMUM' has its own power supply, so no strain is put on the A3000 power supply. There is also an IEC mains output socket for an Acorn type monitor so reducing the number of plugs required to go to the mains. The ULTIMUM is rigidly clamped over the top and under the computer, and allows direct access to the floppy disc drive and reset button, rather than obstructing access as on other systems. One can also place a standard monochrome or 14" colour monitor (even a multiscan type) safely on top. The mounting method employed is so firm that the computer could even be safely transported without the assembly falling apart.

By popular demand, we are now able to supply refurbished and fully guaranteed, Acorn range of Micros.
(Please telephone for price & availability)

Archimedes to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.
New RISC OS Version **Only £15**

Archimedes 5.25"/3.5" Disc drive Interface

With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Upto 4 disc drives can be connected. NO SOLDERING is involved. Supplied complete with necessary lead.
Only £21

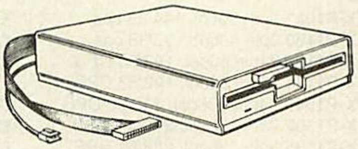
Special Education Prices

All education establishments qualify for special education prices on micros, etc. Please write in or telephone (0923) 37774 or 50335 for written quotation.

BBC MASTER

MASTER 128K Micro incl. Acorn's View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus FREE OFFER (see below) **£399** *(carr £7)*

FREE OFFER



A 5.25" Double Sided, 40/80 track switchable 400K Disc Drive complete with cables and a Utilities disc incl. 2 games, plus

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control.

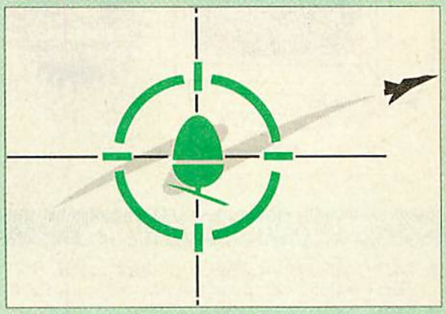
FREE with every BBC Master purchased from us during November

ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module		£115
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Quad ROM Cartridge for Master		£14
Master Reference Manual I	(No VAT)	£14
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64K Upgrade Kit for B+		£32
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Filestore E60S £949	Ecolink	£270

(Carr. £2 to £7 depending on the weight)

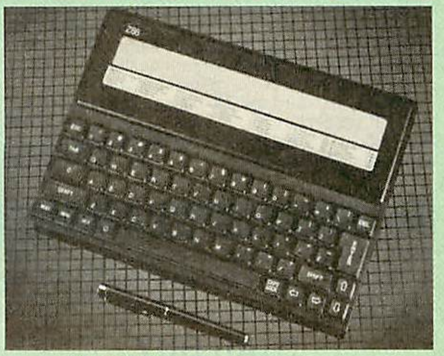
Take the Acorn Archimedes Test Flight and win yourself a Supersonic Concorde Flight



Take the new Archimedes 420/1 Learning system home by booking a slot in Watford's Acorn approved Test Schedule. Call in at our showroom and check it out for yourself – Leave a deposit and you may borrow one of our specially chosen Learning Curve System for up to 14 days. Be satisfied before you buy. Return the system in good order for a complete refund. At the same time you may enter our FREE aviator competition. You could win stunning prizes; Fly in First Class Luxury in Concorde; Learn to fly a helicopter' Take a weekend of flying lessons; and many more prizes. So why not take a test fly at Watford.

For Archimedes Mk II Hand Scanner, Real Time Digitiser, Graphics Tablet, Software & Books, see pages 5, 8, 10 & 12 of our advert.

Z88 Portable Micro



Only: **£195** (Carr £4)

FREE

With every Z88 purchased from us, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

Z88 ACCESSORIES

● 32K RAM Pack or 32K EPROM Pack	£18.00		
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CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

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- **Cub3000** Medium Res for A3000 £195
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- Dust Cover for Microvitecs £5.50
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Multiscan Colour

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- **PANASONIC** – 14" Super High Res. 0.29" Dot pitch, non glare screen. Built-in Swivel base **Launch price** £349
- **EIZO** 9060SZ Low Radiation, Super High Resolution, Antistatic screen, multiscan monitor for a wide range of applications. 800 dots x 600 lines. Display for high res VGA. 0.28 Dot pitch £409
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STAR BUY

- **PHILIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor . A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £179

Dust Cover for Philips Monitors £6
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for 12" Monitors **£8** (carr. £2.50)
for 14" Monitors **£12** (carr. £2.50)

Anti Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for wordprocessor users.

£12

Spare Monitor Leads

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

FREE On-Site Maintenance

This month we are also offering at no extra cost to all our customers, 12 months, On-Site Maintenance on all Microvitec and Multiscan colour monitors; all Panasonic, Hewlett Packard, and all Laser Printers, Roland Plotters and of course the full range of Archimedes micros. Should the machine fail, simply telephone the maintenance engineer, who will call in within 12 working hours. (Offer applicable only when bought at prices advertised in this advert. UK mainland only).

Concept Keyboards

Standard A3 Keyboard with BBC Software	£143
Standard A4 Keyboard with BBC Software	£117
Archi A3 Keyboard	£144
Archi A4 Keyboard	£118

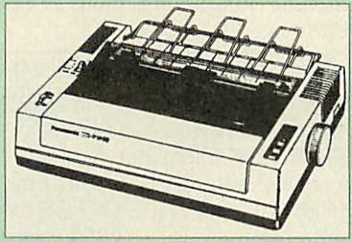
Roland Plotters

(Official Roland Appointed Distributor)

- **DPX 2500** £2389
- **DXY 1100** £545
- **DXY 1200** £715
- **DXY 1300** £899

Panasonic Printers

12 MONTHS FREE MAINTENANCE ON SITE



FREE with every **KX-P1081 & KX-P1180** Printers: A printer lead (please specify type required) and a Dump Out 3 ROM for the BBC Micro or 1,000 sheets of fanfold paper for other micros, please specify)

- **KX-P1081** 9pin 80col. 144/28 cps £124
- **KX-P1180** 9pin 80col. 192/38 cps £134
- **KX-P1123** 24pin 80col. 192/63 CPS £179
- **KX-P1124** 24pin 80col. 192/63 CPS £185
- **KX-P1540** 24pin 136col. 240/80 CPS £390
- **KX-P1592** 9pin 136col. 216/45 CPS £275
- **KX-P1595** 9pin 136col. 288/61 CPS £345
- **KX-P1624** 24pin 132col. 192/63 CPS £318
- **KX-P1695** 9pin 132col. 330/86 CPS £320

Panasonic Accessories

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KX-P1592/1595 (P32)	£175	KX-P1540 (P35)	£175
KX-P1124 (P36)	£85	KX-P1180 (P37)	£79

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P12	4K buffer Board for 1081	£55
P42	32K buffer Chip for 1592/1595	£16
P43	32K Buffer Chip for 1540/1124/1180	£16

Serial Interfaces

P17 P1081/1592 £32 **P19** P1124/1180 £55

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- Colour Jet 132 Printer £515
- Paper Roll £6.50
- Screen Dump Software £10
- Colour Cartridge £19.50
- Colour Textile Cartridge £29
- Black Cartridge £11.25
- Black Textile Cartridge £17
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £123

Citizen Printer

120D Plus	£105	Swift 9	£198
Prodot 9	£275	Prodot 24	£275
Swift 24	£238		

Swift 24 Colour Option £34
Swift 24 Ribbons Black £4 Colour £13

Canon Printer

Canon Bubblejet BJ 130E	£435
Canon Bubblejet 10E	£269

Hewlett-Packard Printers

- Desk Jet 500 £379
- Quiet Jet Plus £415
- Desk Writer £620
- Scan Jet Plus £1199
- Desk Jet Cartridge £15
- HP Think Jet £250
- Paint Jet Colour £676

Star Printers

- **LC10** 9pin 80col. 144/36 CPS £119
- **LC10** Colour 9pin 80col. 144/36 CPS £158
- **LC10-II** 9pin 80col. 180/45 CPS £145
- **LC15** 9pin 136col. 180/45 CPS £250
- **LC24-10** 24pin 80col. 180/60 CPS £185
- **LC24-15** 24pin 136col. 200/67 CPS £315
- **XB24-10** 24pin 80col. 240/80 CPS £379
- **XB24-15** 24pin 80col. 240/80 CPS £489
- **XB-24** Colour Kit £35
- **LC-200** Colour 9pin 80col. 180/45 CPS £185
- **LC-24-200** 24pin 80col. 222/67 CPS £229
- **LC24-200** Colour 24pin 80col. 222/67 CPS £265

Star Accessories

Cut Sheet Feeder

LC10/LC24-10	£65	LC15/LC24-15	£125
XB24-10	£80	XB24-15	£139
LC24-200	£63		

Serial Interfaces

SPC-10 LC10; LC10-II; LC10-Col; LC15; LC24-10; LC24-15; LC-200; LC24-200 £49
8K Ser LC-200; LC24-200; FR10; FR15; XB24-10; XB24-15 £64

Paper Roll Holders

LC-200; LC24-200; LC24-200 colour £29

Buffers

32K Ram Card for LC24-10; 15 & 200	£55
32K Ram Card for XB24-10 & 15	£55

Ribbons

LC10; LC10-II; LC15	Black £4;	Colour £6
LC-200; LC24-200	Black £5;	Colour £12
XB24-10; XB24-15	Black £5;	Colour £12

Laser Printers

Canon LBP-4	4ppm	£735
Canon LBP-8 III	8ppm	£1279
Epson EPL7100	6ppm	£779
HP Laserjet IIP**	4ppm	£725
HP Laserjet III	8ppm	£1199
HP Laserjet IIID	8ppm	£1875
Panasonic KX-P4420	8ppm	£785
Panasonic KX-P4450i	11ppm	£1105
Panasonic KX-4455 Postscript	11ppm	£1799
Qume Crystal Print WP+		£749
Qume Crystal Print Ser. 2		£1065
Qume Crystal Print Publisher 2		£1899
Star LP-8 II		£1099
Star LP-8 Star(post)script		£1575

** Lower Paper Cassette Tray & Premier Collection Software, **FREE** with every HP Laserjet IIP printer purchased from us. Offer subject to availability.

Laser Toners

Canon 2 & 4	£60	Laserjet II & IIP	£60
Epson GQ	£18	Laserjet III	£75
Star LP-8	£59	Qume Crystal	£63
KX-P4420/50	£25		

Laser RAM Upgrades

HP Laserjet II RAM		GQ5000 512k		£99
Jetware II 1MB	£175	KX-P4420	1M	£249
Jetware II 2MB	£330	KX-P4450i	1M	£299
Jetware IIP 1MB	£199	KX-P4450i	2M	£575
Jetware IIP 2MB	£319			

Laser Drum & Developer

- Epson Drum £129
- Panasonic 4450 Drum £119
- Panasonic Developer £90
- Qume Drum £76

Epson Printers

EX800	£410	LQ1050	£540
EX1000	£540	LQ1060	£619
FX850	£295	LQ2550+	£729
FX1050	£370	LX400	£120
FX1060	£599	LX850	£179
LQ400	£179	SQ850	£515
LQ550	£246	SQ2550	£779
LQ850	£439	TLQ4800	£1449
LQ860 Colour	£499		

Cut Sheet Feeders for

EX800/FX800/850/LQ800/850	£130
FX1000/LQ1000/1050	£175
LQ2550	£390
LX400/800/850/LQ400/500/550	£69

Tractor Feed for

LQ800 **£44;** LQ850/FX850 **£69;** LQ1050/FX1050 **£85;** LQ2500 **£90;** LQ2550 **£90.**

Accessories

- EX800/1000 Colour Option **£45**
- EX800/1000 Colour Ribbon **£14**
- LQ2500 Colour Option **£65**
- Multifont Card for LQ550/850/1050 **£95**

Epson Printer Interfaces

All these interfaces fit inside the printer

RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£40	RS232 + 8K Buffer	£79

Printer Leads

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 6'	£6
Nimbus Centronics Lead	£6
IBM/Archimedes Parallel Lead 6'	£6
IBM/Archimedes Parallel Lead 5 metres	£13
IBM/Archimedes Parallel Lead 10 metres	£19
Double Ended 36 way Centronics Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.
IBM Keyboard extension lead coiled	£5

Important Notice to All our Customers

Watford Electronics only supplies printers fitted with British Specification 240V AC Mains 3 core cable with connections for Live, Neutral and Earth. We do not sell, nor intend to supply grey imports from Europe or Hong Kong with incorrect 220V European mains connections (2 core cable!) which could be dangerous to the end user.

Megabuffer 256



The Smallest 256K Printer Buffer Unit in the world **38mm x 130mm x 134mm.**

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatiblity with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in text unit for both the buffer & your printer.

Only £119 (carr £5)

Universal Printer Sharers/Changer

Connect up to 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spaghetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments)

Connects	Serial	Centronics	P&P
2 to 1	£16	£17	£3
3 to 1	£22	£24	£3
5 to 1	£36	£32	£4

(Cables extra at £6 each. Please specify type required when ordering)

2 Way Compact Printer Switch

A handy 2 way compact printer switch. Enables one micro to be connected to 2 printers or vice versa.

Centronics **£18;** Serial **£17**

(Cables extra at £6 each)

Auto Printer Sharer Switch

Connects	Serial	Centronics
2 to 1	£36	£39
4 to 1	£59	£55
8 to 1	–	£85

256K Multi Spooler

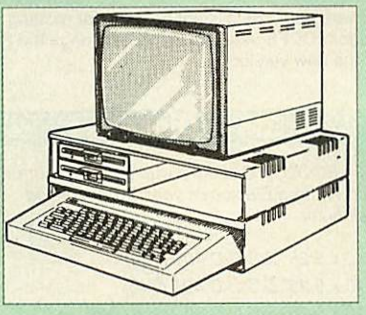
(Auto Printer Sharers – Centronics)

- 2 In/1 out **£135**
- 4 In/2 out **£169**
- 8 In/1 out **£199**

Compact Converter Units

Serial to Parallel **£36** Parallel to Serial **£37**

Plinths for BBC Micro, Master & Printer



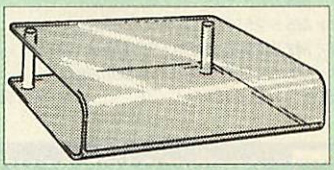
Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	420 x 310 x 105mm	**£13**
Double BBC Plinth	420 x 310 x 210mm	**£24**
Printer Plinth	420 x 310 x 105mm	**£12**
Single Master Plinth	490 x 310 x 105mm	**£14**
Double Master Plinth	490 x 310 x 210mm	**£26**

(Carr. Single plinth £2; double plinth £3)

Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version	**£16** (carr £3)
136 Column version	**£20** (carr £4)

Listing Paper (Perforated)

- 1,000 Sheets 9.5" x 11" Fanfold Paper **£7**
- 2,000 Sheets 9.5" x 11" Fanfold Paper **£11**
- 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold **£21**
- 1,000 Sheets 15" x 11" Fanfold Paper **£9**
- 1,000 Sheets true A4 Fanfold Paper 70gms **£11**
- 2,000 Sheets true A4 Fanfold Paper 70gms **£21**
- Teleprinter Roll (Econo paper) **£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

Printer Labels

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£6.00
1,000 90 x 36mm (Twin Row)	£6.25
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.75

Carriage on 1,000 Labels £1.00

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
Brother HR15/20	£6.00	–
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£2.75	£4.50
DMP2000	£2.75	£4.75
EX800/1000	£3.50	£5.00
RX/FX80/85/800/MX80	£2.95	–
FX/MX/RX100/1000	£3.95	–
Kaga/Taxan KP810/815	£3.25	£5.00
LQ400/500/550/800/850	£3.25	£6.00
LQ1050/LQ2500	£4.00	–
LX80/86/800/850	£2.75	£4.50
LX400	£3.50	£5.00
M1009/GLP	£2.95	£3.75
NEC P2200	£4.50	£5.00
Panasonic KX1080/81	£3.25	£4.75
Panasonic KX-P1124	£7.50	£5.00
SQ2500	£23.00	£5.50
Star LC10/NL10	£2.75	£5.00
Star LC24-10	£2.95	£6.00
Olivetti Ink Jet Cartridges (set of 4)	£9	

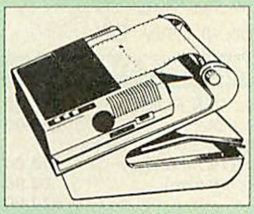
Our attractive Dust Covers are manufactured from translucent PCV. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Original Panasonic Ribbons

Guaranteed to last 3 million characters

P110 for KX-P1081, 1592 & 1595	£8
P115 for KX-P1180	£8
P145 for KX-P1124	£8
P140 for KX-P1540	£10
Colour Ribbons for KX-P1081, 1592 & 1595 Brown, Blue or Red	**£9.95 each**

Professional Printer Stand



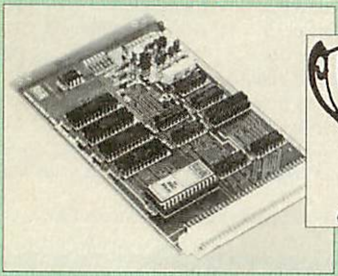
The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and refold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergon-omic design ensures smooth paper flow and automatic refolding.

80 Column version £23 (carr. £3)

132 Column version £28 (carr. £4)

Continued→ → → → → → → → → →

Archimedes Real-Time Digitiser





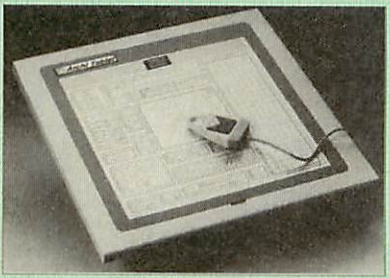
Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £175

A Set of Colour Filters for colour image grabbing using a video camera	£16
New Risc-OS Software Upgrade	£39

Archi Graphic Tablet



The Archi Graphic Tablet offers performance and accuracy comparable to other tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely. The package is supplied complete with sophisticated Archi software. (Now, fully LinCAD compatible. Recommended by Linear Graphic).

(FREE this month, PC Mouse Drivers & Art package)

(Now, fully LinCAD compatible. Recommended by Linear Graphic).

(FREE this month, PC Mouse Drivers & Art package)

Special Price £225

(Price includes Tablet, Leads, Software & Puck)
Stylus Optional Extra **£29**

Disc Plonker Rack



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the harzards of fingerprints, scratches, dust, coffee and an untidy desk. Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: £2

Acorn & Watford DFSs

● Watford sophisticated DFS ROM	£16.00
● Watford DFS Kit complete	£69.00
● We will exchange your existing ROM for Watford's ultimate DFS ROM at only	£12.00
● DFS Manual (comprehensive)	£6.95
● Acorn DNFS ROM	£17.00
● Acorn ADFS ROM only	£25.00
● Acorn 1772 DFS ROM Kit	£49.00

(The single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with the their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£39.00.**

● SPECIAL PRICE	**£44.00**
● DDFS Manual	(No VAT) **£6.95**
● We will exchange your existing DFS Kit for our sophisticated DDFS for only	**£30.00**

Please note, as the MkII DDFS is a hardware and sofware upgrade, it is not possible for existing Watford DDFS users to simply exchange the ROM for the new version.

3M – Diskettes

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electonics your 3M Appointed Distributor

● *10 x 5.25" S/S D/D 40T (744)*	*£5*
● *10 x 5.25" D/S D/D 40T (745)*	*£5*
● *10 x 5.25" S/S D/D 80 Track (746)*	*£7*
● *10 x 5.25" D/S D/D 80 Track (747)*	*£7*
● *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT*	*£11*
● *10 x 3.25" S/S D/D 40/80 Track*	*£7*
● *10 x 3.25" D/S D/D 40/80 Track*	*£8*
● *10 x 3.5" Double Sided High Density*	*£15*

Top Quality 3.5" & 5.25" Diskettes

To complement our range of Quality Discs and Disc Drives. WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

● *10 x **M3** 3.5" D/S D/D 80 Track*	*£7*
● *10 x **M9** 3.5" D/S High Density*	*£14*
● *10 x **M4** 5.25" S/S D/D 40 Track*	*£5*
● *10 x **M5** 5.25" D/S D/D 40 Track*	*£5*
● *10 x **M7** 5.25" D/S D/D 80 Track*	*£7*
● *10 x **M8** 5.25" D/S H/D Hi-Density*	*£11*
● ***M2** 3" Double Sided*	*£2.50 each*

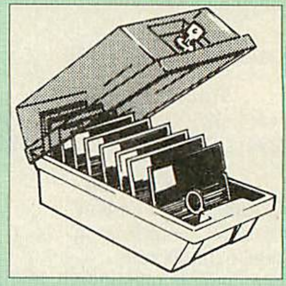
CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

Floppy Head Cleaner Kit

The heads in floppy drives are precision made and very sensitive to dirt. The use of cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

Antistatic Lockable Disc Storage Units

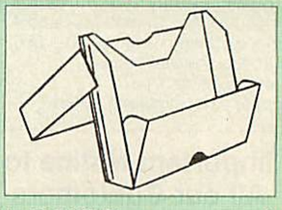


Gives double protection – Strong plastic case that affords real protection to your discs.
Antistatic helps avoid data corruption whilst in storage. The smoked top locks down.
Dividers and adhesive title strips are supplied for efficient filing of discs.

● **M35** – holds up to 50 5.25" discs	**£4.95**
● **M85** – holds up to 95 5.25" discs	**£6.95**
● **M25*** – holds up to 25 3.5" discs	**£4.95**
● **M50** – holds 50 3.5" discs	**£6.50**
● **M10** – holds 8 of No. 10 Data Cartridges	**£15**

* Not lockable

Plastic Library Cases



Holds up to 10 5.25" Discs. **Only £2.00**

Dust Covers (For our Disc Drives)

Single CLS (without PSU)	**£3.20**
Single CS (with PSU)	**£3.25**
Twin CLD (without PSU)	**£3.85**
Twin CD (with PSU)	**£3.90**

Disc Albums

Attractively finished in black leather-look vinyl. Stores up to 20 discs. Each disc can be seen through the clear view pocket.

£4

Special Bulk Offer on Discs

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

PRICES SLASHED

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves 5.25"	£30	£35	£40
● With Sleeves 5.25"	£33	£38	£43
● 3.5" D/S D/D	£22 for 50		£40 for 100

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below. The tinting of the boxes indicates 40/80 track switchable disc drives. For ease of use, the switches are mounted on the front panel.

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. *Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high qulity NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

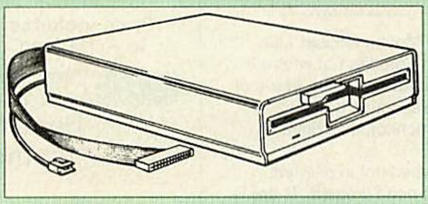
If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

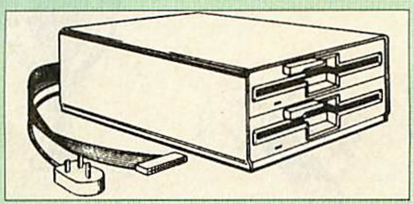
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. ***Ideal for Schools & Colleges.***

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. (Turn to the 4th page of our advert for the Plinths).

P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415





"Test Bureau Approved for Use in Education"

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
400K (720K)	CLS 400S £74		CS 400S £83	
800K (1,44M		CLD 800S £149		CD 800S £162

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £6 to £7

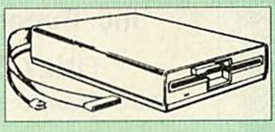
Prefix ***C*** *= Cased Drive* — *Suffix* ***S*** *= 40-80 Switchable*
L *= Less PSU*
S *= Single*
D *= Double*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5.25" 400K, (720K in double density); Double sided; 40/80 track switchable.

Refurbished Disc Drives now available
CLS400 £50; CLD800 £98; CS400 £59; CD800

Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

Special 40/80 Disc Drive/DDFS Mk II Offer



● The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.

● Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both Single & Double Density modes.

● A comprehensive User Friendly Manual.

A Bargain at Only **£119** (£7 carr) (Offer valid while stocks last)



3.5" DISC DRIVE OFFER

These top quality 3.5" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Drives to connect to BBC Micros own PSU

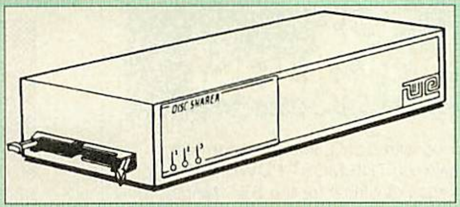
● CLS35 400K Unit £65 ● CLD35 Twin 800K £119

Drives with built-in Power Supply Unit

● CS35 Single 400K £85 ● CD35 Twin 800K £129

(P.S. CS35 Single is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage).

DISC DRIVE SHARER

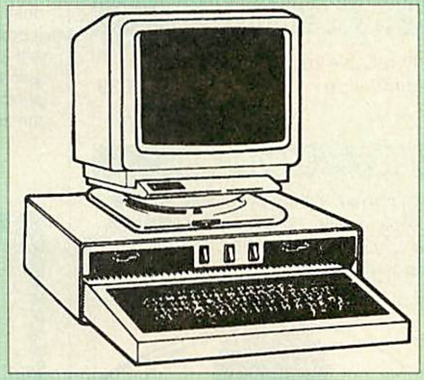


(Ideal for educational establishments)

At last, a low cost alternative to the Econet system.Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Price includes 3 Cables — Offer Price : **£55**

CDPM 800S — DP35-800S



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDPM 800S for the BBC B & Master £165

A Double disc drive with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master series is the 5.25" disk, the standard of the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S. It contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. DP35-800S has its own power supply, independent of the BBC Micro.

DP35-800S for BBC/Master £154

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued→ → → → → → → → →

QUEST MOUSE Mk II

- Quest Mouse II & Quest Paint £58
- Quest Mouse II, Quest Paint, AMX Stop Press & Pagefont £89
- Quest Mouse II only £29
- Quest Paint Software only £34
- Quest Font Disc (22 Text Fonts) £15
- Quest Mouse Mat (Red or Blue or Green please specify) £3
- Part Exchange your unreliable AMX Mouse for a Quest Mouse for only £22

(P.S. Quest Paint is not compatible with BBC Compact)

Quest Paint is the winner of the BBC Acorn User 1990 Award for the Best Art/Graphics software

ConQuest

Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

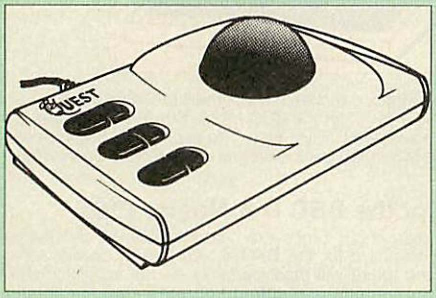
ConQuest ROM Package £30
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

ARCHI Mk II MOUSE

An extremely reliable replacement mouse for Archimedes Micro £39

QUEST – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version **£32**
QT-20 Archimedes Version **£35**

RB2 Marconi TRACKER BALL

RB2 (AMX/Quest compatible)	£45
RB2 including Quest Paint	£75
RB2-A for Archimedes	£46

THE NEW Mk III AMX MOUSE

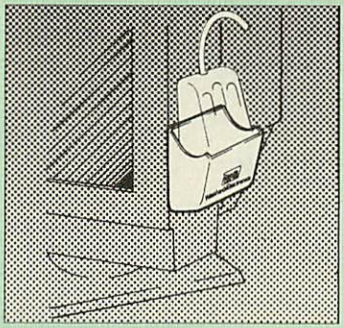
Inc. Super Art package

ONLY: £59 (carr £3)

(Please specify for BBC, Master or Compact)

MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32
PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£13
AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£20

WE Mouse House



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive or desk.
It protects it from damage when not in use, yet within easy reach when you need it again. There is also a second compartment for your pens and pencils – and at £4 it doesn't cost a rodent's ransom.

Price £4



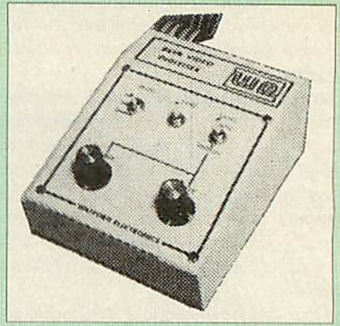
Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)

Only £21

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Admin Xtra Disc Utility	£13
Fonts N Graphics Disc Utility	£13

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro. This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket. The software supplied includes a sophisticated, fast screen dump routine.
Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

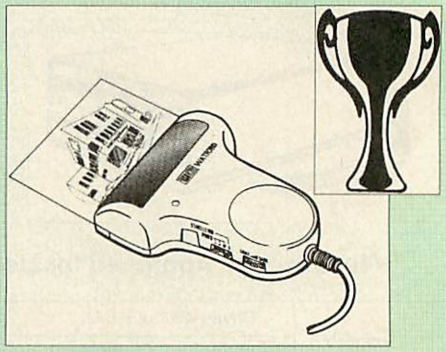
£109 (Carr. £5)

(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

The Beeb HandScan

Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer the BBC Micro computer.
The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.
All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

Beeb HandScan & Firmware **£135**



Winner of the BBC Acorn User 1990 Award for the Best DTP/Word Processor

The Wapping Editor

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

Page Layout Section

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module incorporates the facilities like: pencil, brush, airbrush, polygon, circle, eclipse, fill, cut & paste, etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be – it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

Word-Processor

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

The Font Editor

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.
Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser.

Wapping Editor Software Pack	**£69**
Wapping Editor plus Mouse	**£89**

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc.
Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

Wapping Font Disc 1

Sixteen Wapping Editor fonts including smaller versions of Oberon and Daisy and two new sizes of the standard font.
Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions.

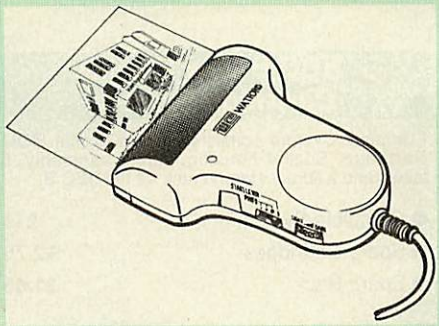
£12

Wapping Font Disc 2

This new addition to our Wapping range of DTP software provides you with additional 23 fonts.
On 80 track disc only

£13

Archi Mk II Hand Scanner



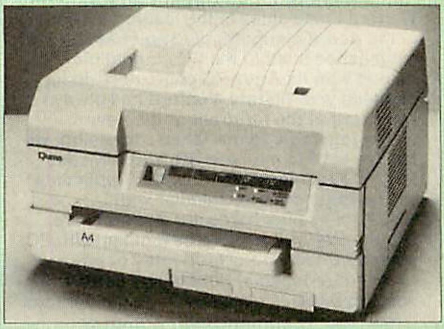
Watford Electronics is now able to offer a complete hand held scanning package, possibly the most essential addition to any desk top publishing system. The package includes the most comprehensive utility software available for the Archimedes, a high quality, ergonomically designed to fit the shape of your hand, (see drawing above) scanner, which is fitted with a warning LED that will indicate if the scanner is being moved too quickly for accurate results. Additional twin guide rollers ensure precise tracking over the image, to make the best use of the high resolution available with this system. The yellow/amber illumination of our Mk II scanner, enables you to achieve optimum accuracy. It is capable of scanning upto an amazing 400 DPI. The scanning area is 4" wide and the height is only limited by the maximu amount of memory available.

On board ROM software supplied, is the most sophisticated Archimedes scanner software yet written.

AHS-4 Archi 300/400 Version	**£149**
AHS-3 Archi A3000 Version	**£175**

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

Laser Direct



By using the power of the Archimedes RISC processor, it offers the best of both worlds – print speed up to 5 times faster than typical Laserjet compatibles – uses outline fonts so that any font can be scaled to any size – works with all programs that use RISC OS printer drivers. Ideal for use with Genesis, !Draw, Acorn DTP, Impression, etc. Includes 50 sheet paper tray and a single sheet/envelope tray. Requires one expansion slot and at least a 2Mbyte Archimedes. A very compact printer, a very low initial cost and very low running costs.

Launch Offer: £849

High Res Laser Direct Card **£245**

(For demonstration, call in at our retail shop)

ArcLaser

ArcLaser uses the considerable power of the Archimedes to control the Laser printer directly via a very high speed interface software. This gives speed and economy. The Scaleable fonts facility enables every font to be scaled to any size at 400 dpi, and in portrait or landscape mode. Full Page Graphics produced in 20 to 60 seconds at 300 dpi typically.

Introductory Offer: £799

(Price includes, Laser Engine, Card, Software & Operating manual)

Beeb PC (BASIC)

Beeb PC Basic is designed for program authors wishing to convert programs so that they will run on IBM personal computers. To convert BBC BASIC programs manually can waste days of valuable time with every occurrence of common statements such as PROC, DEFPROC, TAB, having to be changed.
Beeb PC (BASIC) automates many of these changes, and will convert majority of BBC statements that are invalid for IBM BASIC into equivalent acceptable statements. In addition BBC BASIC data files can be converted to IBM BASIC format, with support provided for all BBC data formats:- INTEGER, REAL & STRING.

Price: £38

Beeb DOS 2.2

The BBC and IBM PC's are the most popular micros in the UK. The BBC is firmly established in the education sector and the IBM is the industry standard in the business world. The pools of information and applications held on these computers are immense, yet the means of passing information between them are very limited. Beeb DOS provides a practical method of transferring information between these two micros.

Beeb DOS is a collection of utilities which run on the PC's and enable it to read and write information on BBC discs. You can transfer files between your PC's 360K floppy, high density floppy or hard disc and your BBC discs. In addition Beeb DOS allows you to catalogue, format and compact BBC discs and delete, re-name, lock and unlock BBC files, all on PC's. Each Beeb DOS utility is written in IBM assembler and is run directly from PC or MS-DOS. The Beeb DOS utility can be run from floppy disc, hard disc or RAM drive.

Beeb DOS is supplied on an IBM 5.25", 360K disc complete with a comprehensive operating manual. (Will only work on 360K Disk Drives)

Price: £39

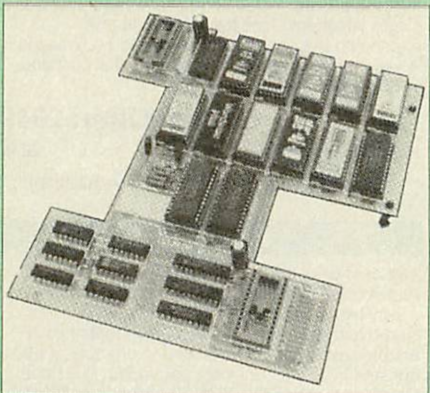
(Please write in for technical literature)

Continued→ → → → → → → → →

STAFF VACANCIES

Watford Electronics is the leading supplier in the Acorn computer field and has established itself in the PC compatible market with its Aries PC computers. In its eighteen year history, Watford has always kept itself at the forefront of the new technology. Due to our latest expansion, we require staff to man our BBC/Archimedes and PC Technical Departments. Applicants will be required to be familiar with BBC/Archimedes hardware and software, and PC staff will need to be familiar with PC computer hardware. Good rates of pay, excellent prospects. Subsidised company accomodation is available to single persons if required. Telephone Keith Archer or Richard Overfield for interview, or write to us enclosing your CV.

Solderless Sideways ROM Socket Board



The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:

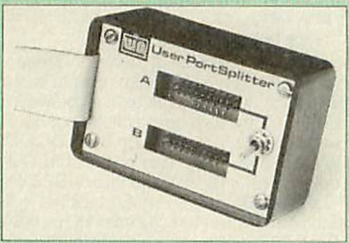
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery Backup fitted **£39**
Battery Backup only **£3**
16K Sideways RAM **£8.50**
(carriage £3)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

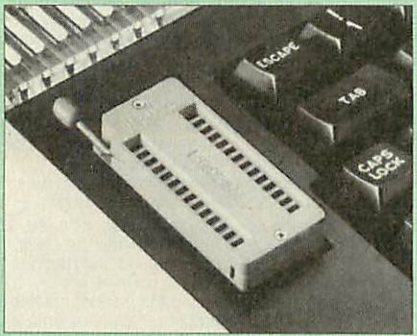
User Port Splitter Unit



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination

Excellent Value at **£22** (carr £2)

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£18** (carr £3)

BBC B Low Profile Cartridge System

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

Complete System	**£11**
Spare Cartridges	**£2.75**
Spare Rack	**£1.65**

ROM Cartridges for the BBC Master

Will accept the new larger PIggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc

Twin **£9**; Quad **£14**

16K Disc Ram Module

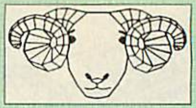
(16K Sideways RAM Module)

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances)
- Compact construction
- No overheating or overloading problems.
- Free utilities disc supplied
- Can be used as a 16K PRINTER BUFFER.
- Ideal for profressional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional Battery back-up fitted £3



ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Cobal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved ★FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as th printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on you BBC micro – no flying leads to connect and no soldering. Provision of the onboard ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£69** (carr. £3)

Aries B-12 Sideways ROM Board

The B-12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost

Price:	Aries B-12	**£36**
	Aries B-12C	**£5**

Aries B-488 IEEE-488 Interface Unit

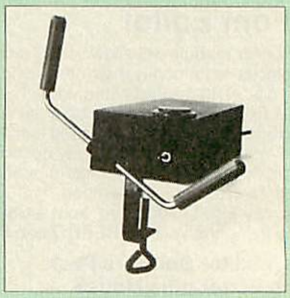
The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

Voltmace Joysticks

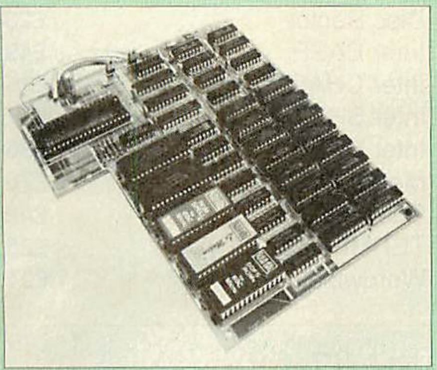
Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	**£15**
Delta 3C Joystick for Compact	**£10**
Delta 14B Single Joystick	**£11**
Delta 14B/1 Adaptor Module	**£12**
Transfer Software Disc-Tape	**£7**
Delta-Cat A mouse eliminator Joystick for the Archimedes	**£24**

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128 **£25**

ROM/RAM Card



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 7 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- *Fully buffered for peace of mind.*
- Compatible with BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROMSPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM — £48
- ROM/RAM card with 64k dynamic RAM — £65
- ROM/RAM card with a massive 128k dynamic RAM — £109

(carriage on ROM-RAM Card £3)

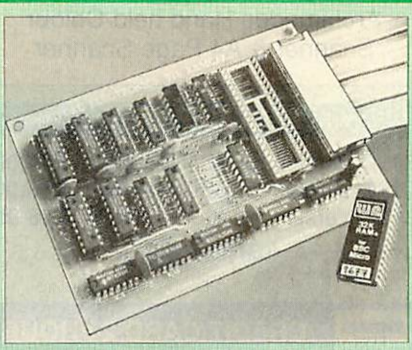
OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit — £9
- 16k Dynamic RAM for Upgrade — £13
- Battery backup — £3
- Read and Write protect switches — £2 each

Complete ROM-RAM board All options installed — £115

P.S.
IS your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford, ROM/RAM Board and pay £5 less.

32K Shadow RAM/Printer Buffer Card Expansion Board



A MUST FOR WORD PROCESSING

Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16k or even 20k, but a massive 32k of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.
- Use the FULL 32k or the bottom 12k of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS432 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138, 145,ADVAL etc). Please note only a 12k printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £3)
(Price includes a comprehensive manual and the ROM)

BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs — £11.25
- Maths with a Story 2 (Disc). 4 further maths programs. — £11.25
- Picture Craft (Disc) 6-14 age group. Pack consists of flexible geometrical design & colouring programs. — £17.00
- ECOLOGY O-Level program. — £20.00
- POLYMERS O-Level program. — £20.00
- Classification & Periodic Table O-Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. — £20.00
- DEUTSCH DIREKT! (Disc & Audio Cassette) — £19.95
- ADVANCED TELETEXT SYSTEM — £8.65
- PERIOD TABLE SOFTWARE — £20.00
- Astronomy – Primary (Disc) — £12.00
- Computers at Work – Primary — £17.35
- Introducing Geography 11-17 years — £17.50
- Electric Fields 6-14 years — £11.25
- Black Queen Contract Bridge — £13.00
- Espana Viva – 3 Discs — £19.95
- WHITE KNIGHT Chess game — £16.00
- Inside Science — £22.00
- A Vous La France — £29.00

More Educational Software

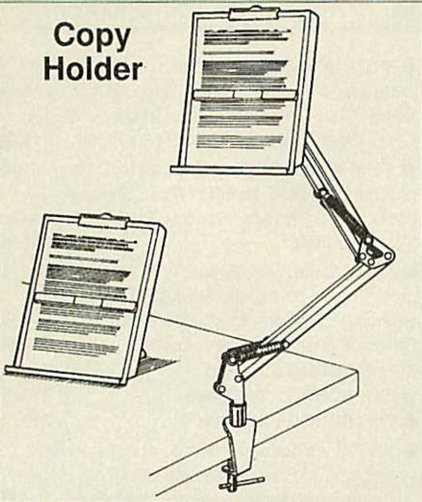
- **FUN SCHOOL 2 – Red:** Under 6 yrs – 8 programs on Discs, Shape Snap, Find the Mole, Teddy Count, Write a letter, Colour Train, Pick a Letter, Spell a Word & Teddy Bears Picnic. **£12.00**
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- **FUN SCHOOL 3 – Red** — **£19.95**
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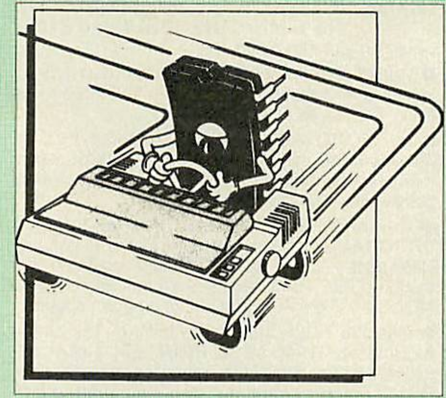
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The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built-in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redifinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute ★ command when printing.

Other features include a very powerful on-screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory-based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips.

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Wordwise plus **£40**

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear test-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc interface in your Micro)

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"Why has no-one written a book like this before? It's long overdue".

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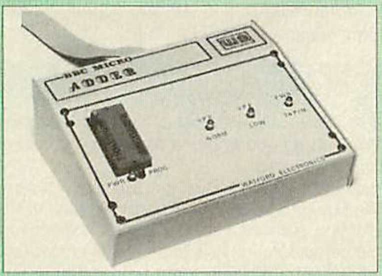
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ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
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- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
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- Programs the following EPROMs: 2516, 2716, 2532, 2732, 2764, 27128, & 27256.

£65 (£5 Carr)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. £32(carr £3)
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Watch this space for our forthcoming new products for the Archimedes Micro

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This king size multipurpose foam cleaner spray is ideal for cleaning Keyboard, Monitor, Disc Drive & Computer furniture surfaces. **£2.50**

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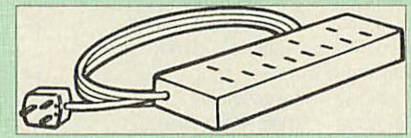
BBC Refurbished Keyboard	£46	Speaker	£3
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Fitted in place of your normal mains plug, this device protects your equipment (and data from corruption), against mains high voltage translent spikes/surges caused by lightening or thermostats switching.

Protection for only **£8.50**

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4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. **£9.50**

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SOLDER type **£1.50** IDC CRIMP type **£1.95**

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Increase the speed of your Disc Drives by soldering this switch to your BBC B or B+ keyboard

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(All ready made and tested)

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Supply from BBC power supply to standard Disc Drive Connection: Single **£3.00**; Dual **£3.75**

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Disc Drive Plug 4 way	100p	–
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Watford DATA DUCK

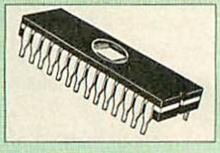
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Watford POWER DUCK £8

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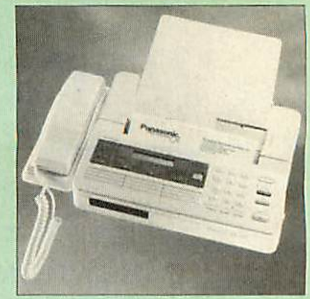
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EIGHT BITS

£5 VIEW VERTICAL TABBING

It is rare to see original items for *View* these days, but **Jeremy Weinbren** of Guildford has written in with a short tip that I haven't heard before.

It concerns inserting blank lines into a *View* document, which can be very useful. If you need to manually paste a graphic onto a page, or spread out some text, you would normally have to press RETURN a few times, leaving a large gap on the screen. If the gap is more than a screenful of lines, you end up with an apparently blank screen when paging through a blank document.

It is possible with some utility programs to insert a command which performs linefeeds to the printer, avoiding the spacing on screen, but this confuses *View* as to where the end of the page is, and requires additional software. Jeremy has come up with a simple method, using the *View* macro facility to insert as many linefeeds as required. Define a macro at the top of the document as follows:

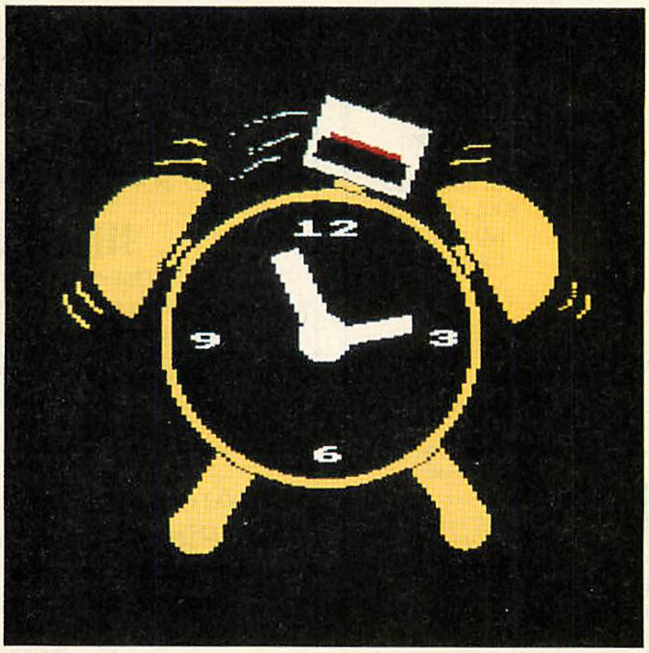
```
DM LF
SR A @0
LS |A-1
LS 0
EM
```

and then whenever you wish to insert a number of lines into the document, simply type LF in the command margin, followed by the number of lines you wish to insert so, for example, to insert 15 blank lines, type:

```
Some text
LF 15
More text
```

Note that a blank line in the macro between the two LS instructions is vital. It is this line which is being repeated as the macro is executed, so it must be blank.

The macro works by extending the line spacing to the desired number of lines, then executing a single linefeed with the blank line. The line spacing is then reset to zero. Not only is this a good piece of lateral thinking, but also a neat demonstration of the use of arithmetic within a macro (LS |A-1).



Note that, if you are working with another LS setting in the document, you should enter this LS at the end of the macro rather than LS 0.

£10 FUN WITH CLOCKS

Regular Eight Bits contributor **Andrew Pepperell** from Louth, has written a couple of programs which utilise the real-time clock of the Master 128, and which, incidentally, should also work with the PMS or Solidisk real-time clocks on the BBC model B and other models.

The first program is an alarm program, which allows you to set an alarm on the machine which will beep at the required time, provided of course that the alarm is not reset in the intervening period, and the machine is on at the time specified. The program supplied in the yellow pages can be typed in (or loaded from the monthly disc), and, when run, a machine code program called *Alarm* will be created. The machine code file is just under one page in length – by default, the program resides at &900, but this can easily be changed if required.

The program is used by typing *ALARM followed by the hour and minute at which you wish the alarm to ring, in the form hh:mm. The time must be five digits in length, and have a colon separator between the hours and the minutes. Two digits must be used throughout when specifying times, eg, 06:03, or 23:59.

Nothing particular happens after you have set the alarm, until the appointed time, when a short two-tone beep reminds you of the alarm time. This can be replaced with something else by putting different code in the routine .doalarm. The most useful application of this program is when you are perhaps working on a long document, and need to remind yourself when to stop/ phone someone/go home.

Alternative jobs which could be performed at the specified time include disabling the display, or even parking the heads of hard disc drives ready for a shutdown. Note that because the routine is called from an event vector, with interrupts disabled, some actions may not return properly after execution.

On typing *ALARM, the program works by firstly disabling events, then reading the remainder of the syntax and redirecting the event vector to the start of the time checking routine. Events are then re-enabled before control is passed back. Thereafter, a routine is called which increments a counter 50 times per second. When this reaches 50 (once every second), a different part of the program is called which reads the real-time clock (with OSWORD 14), and then checks the five digits relating to the hours and minutes against the specified time. If these are equal, the routine .doalarm is called.

Unfortunately, due to the amount of time taken by the OSWORD 14 call, the program does slow the computer down a

little. This is one reason why the checking routine is only invoked once every second rather than (more simply) calling it every 50. However, the delay causes only a decrease in speed of about 0.3 percent, and so is not that serious for most applications.

The alarm works from within Basic, the *View* family and probably most other serious software, as long as events are not disabled and the EVNTV vector is not otherwise redirected.

Andrew's second program provides an on-screen, real-time clock for *View*. The clock is placed in the centre of the screen, irrespective of whether you are working in 20, 40 or 80 columns, and at the top of the screen, ie, overwriting part of the top ruler.

The listing in the yellow pages produces a machine code program called *Vclocks*. When this file is present on disc, you can install the *View* clock by typing *VCLOCK. Incidentally, the clock works fine in Basic and other languages, although screen scrolling upsets it.

The event vector is redirected to point to the start of the clock routine, after first disabling interrupts. Thereafter, 50 times per second, a counter is incremented until it reaches 50, which obviously occurs every second.

Then, an OSWORD call with A=14 is issued to read the clock, after first putting a zero byte at the start of the buffer. The eight bytes relating to the time are then extracted from this and displayed at the top of the screen. The position at which the time is printed is determined by the screen mode, which, after being read from location &355, is cross referenced in a table containing the horizontal positions to centre the text.

After the time has been displayed, the cursor is moved back to its original position and stored at &310 and &311. Although the clock corrupts part of the ruler, tabs 'underneath' the displayed time are still usable, but are invisible.

£10 ACCOUNTING WITH VIEWSHEET

R Horne from Auckland, New Zealand uses *Viewsheet* for his accounting. He writes:

'I purchased a Beeb with a 6502 co-processor and *Viewsheet*, specifically for business accounting. Now that I have graduated to an A3000, I wish there was an upgraded version of *Viewsheet* which could use the Ram available. *Lotus 1-2-3* and similar spreadsheets are far too sophisticated for my needs.

I originally needed to analyse ledgers and journals into 100 account codes or headings and to make each transaction traceable for audit purposes. After unsuccessfully seeking help from suppliers, I discovered that the *Viewsheet Guide* gave all the necessary pointers – hence my choice of the BBC.

With some 300 entries each month, prime entries have to be split between two sheets – one covering four bank or cash accounts (including one foreign bank account), and the other all journal entries. The cash amount of each entry is 'written' to a link file for further manipulation and is then 'read' back into an analysed trial balance. The accumulated data is then 'written' back to the link files and subsequently 'read' into a balance sheet, profit and loss ac-

count and various other report forms.

Because of the number of account codes, the analysed trial balance extends over three sheets (termed costsheets) and the balance sheet and other reports are contained in yet another sheet. To achieve the analysis required, and to obtain visibility of each individual transaction, the following technique is used.

Each account code comprises three digits, the first of which designates the link file and associated cost sheet, and the following digits the individual account number. Thus all cost items have a code in the range 101-140, all revenue and assets have a code in the range 201-240 and all liabilities have a code in the range 301-330.

A cash book line looks like figure 1.

Columns F and H are used to achieve the analysis and posting to the link files. The entry at column F on each line is:

```
IF((D"ROW"*100+E"ROW")
=E6,MAX(F8F"ROW")+1,0)
```

The contents of slot E6 will be explained later. Row 8 is the first data entry row – so, if there were eight scattered entries related to code 101 (entered as 1 in column D and 1 in column E), then re-calculation produces entries from 1 to 8 in column F on the rows related to code 101 entries.

The entry at each line in column H is:

```
WRITE(D"ROW",E"RO
W",F"ROW",G"ROW").
```

```
.....A    .......B   ....C   ...D    .....E    ........G
Folio     Supplier   Goods   Code    Code      Amount

(Cheque   (Name)     (Type)  (1st    (2 & 3    (Cash +-)
number)                      digit)  digits)
```

Figure 1: A typical cash book line

In the hypothetical case just referred to, the amounts in column F related to each of the code 101 entries written to link file V.Vs1, column 1, rows 1-8.

The formulae in columns F and H were entered by replication and the term "ROW" is used above to indicate replication 'R'elatively.

To ease the pain of entering each code individually at slot E6, a code two below the series being posted (eg, 98 for the 100 code series), is first entered at E6 and E6+1 entered at E7. After re-calculating once, the entry at E6 is changed to E7 and thereafter the value of E6 increases by one at each stage.

Resting a small weight on the TAB key enables the computer to be left to itself to 'post' all entries in the 100 series. Similar steps can be taken for the 200 and 300 series of codes.

A similar technique can be used for writing journal entries to the link files, except that the formula in row F should be varied to read:

```
IF((C"ROW"*100+D"ROW")
=E2,('X'+MAX(E11E"ROW")+1,0)
```

where 'X' equals the largest number obtained in column F when posting the cash book. 'X' is entered manually after the costsheet files have been inspected and the linkfiles obtained. This step is necessary to check whether a nil trial balance has been obtained from the cash book or not.

The costsheet files are restricted in size by the memory available and are limited to read-

ing from a linkfile 40 columns by 40 rows. The structure of these is illustrated in figure 2.

```
           ..................A
..1      Title
..2      Code No
..3      Account Name
..4      Total B/Fwd
..5      READ(1,COL,ROW-4)
..6      READ(1,COL,ROW-4)
etc..
..40     WRITE(1,COL,39,A4A39)
```

Figure 2: Costsheet files

All columns are identical except for the individual account names and code numbers.

The brought forward totals are inserted by reading from another linkfile established for that purpose.

Data for balance sheet, profit and loss account, and other reports are read from the linkfiles. Monthly changes are obtained by reading the totals to date (row 40 in figure 2), less the associated total brought forward and the totals to date directly.

I also use a similar technique for club accounts where visibility of each transaction is not required.

In each case it is possible to contain the cash book, journal, trial balance and reports within one spreadsheet. A link file is used only for carrying totals to date forward from month to month.

In these cases the format of the cash book and trial balance appear in figure 3.

	...A	......B	...C	....D	......E	....F
	Code	Account	Name	B/Fwd	Monthly Total	C/Fwd
.180	111	Repairs & Maintain			"Formula"	D180E180

Figure 4: Code totals are read into the trial balance

Column G contains a formula in each row as follows:-

```
IF(E"ROW"=G2,F"ROW",0)
```

thus entry of the code at G2 causes each amount relative to that code to be shown in column G and the total of all amounts charged to that code to be shown in slot G160. These code totals are read into the trial balance by use of a formula in, say, row 180:

```
IF(A180=G2,G160,E180)
```

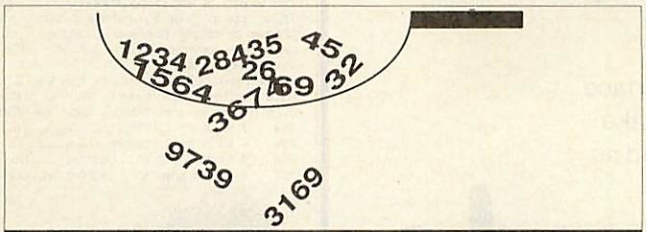
Row 180 then looks like figure 4 (above).

Monthly amounts and totals to date can be read into reports by direct slot reference with sign

	...A	....B	C	..............D	...E	.....F	...G
...4	Date	Folio	Supplier	Goods supplied	Code	Amount	Post
...5				Brought Forward			
...6							
etc.							
	-----	-----	--------	--------------	----	------	----
.160			Closing	Balance at Bank		F5F158	G6G158

Figure 3: Format of cashbook and trial balance

changes where appropriate. The above procedures may be slow in comparison to dedicated software, but they have the benefits of low cost and of being tailored to suit the particular circumstances.



The Sieve of Eratosthenes, generating prime numbers

£5 ONE LINER

One-liner connoisseur and Eight Bits regular **Phil Bender** from Romford has sent in a version of the famous Sieve of Eratosthenes method of generating prime numbers. For those of you who have never come across this method before, here is a brief summary.

The program works by setting a flag array to zero then checking each odd number from three to the square root of the maximum. If it is not marked as a non-prime, print it and flag every other multiple from the square up to the maximum. Even numbers can be ignored, since two is the only even prime. Finally go through the array from the next odd number and, if it is not flagged then it is prime so print it.

This is a fairly standard implementation of the method. The reason for the strange looking sequence mode0:mode 7 is to provide a quick way of clearing the flag's byte array to zero, since this is part of screen memory in mode 0, so blanking a mode 0 screen sets memory from &3000-&8000 to zero. Selecting mode 7 means that the screen printout only affects &7C00-&8000, so &3000-&7BFF – ample space for the array – remains unaffected.

```
10MODE 0:MODE 7:HIMEM=&5400:M%=HIMEM:E
%=9999:F%=-1:PRINT 2;:FOR P%=3 TO 99 S
TEP 2:IF M%?P%=0 PRINT P%;:FOR J%=P%*P
% TO E% STEP P%+P%:M%?J%=F%:NEXT:NEXT
ELSE NEXT:FOR P%=101 TO E% STEP 2: IF
M%?P%=0 PRINT P%;:NEXT ELSE NEXT
```

A one-line Sieve of Eratosthenes

If you have any hints or tips for the Acorn eight-bit range of micros, particularly in the applications, rather than programming field, then we would be pleased to hear from you.

Also applicable to Eight Bits is material on the Psion Organiser, Cambridge Z88, and other notebook machines, especially where the item relates to linking with a BBC.

Write to David Atherton, Eight Bits, BBC Acorn User, *20-26 Brunswick Place, London N1 6DJ.*

WIRED UP

Fun with PETER HAYNES' circuit-mimmicking program

Cellular automata are basically infinite two-dimensional planes filled with squares, a collection of states and a clock. Some simple rules define what happens to each square based on other squares that surround it. The best known example of a cellular automaton is *The Game of Life* (*BAU* May 1988), which was discovered by mathematician John Horton Conway of Cambridge University in 1970 and mimics a colony of bacteria.

Wireworld mimics an electrical circuit and the program allows 'circuits' to be made up of 'wires' and 'logic gates' around which 'electrons' can flow. These circuits are then animated.

In theory, a computer could be designed in *Wireworld*. The cells in the program can be in any of four states: background, wire, electron head and electron tail. Two cells – an electron head and tail – make up an electron.

The rules are fairly simple. At each pulse from the clock electron-heads become electron-tails, electron-tails become wires and depending on the cells around them, wires become electron-heads, and background cells remain the same. Wire cells surrounded by one or two electron-heads become electron-heads but if there are more than two, they remain wire cells.

Circuit components

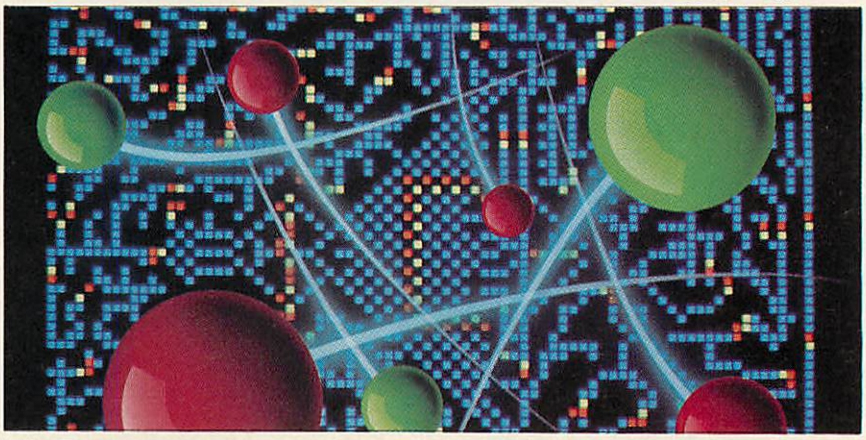
Wires can be made from a linear arrangement of wire cells and by the rules of *Wireworld*, an electron will flow down any wire.

The diagrams opposite show various components of *Wireworld* from which more complex components can be made. The most important is the diode. An electron can pass one way but not the other because the output becomes crowded by three electrons.

An OR gate can then be made from two diodes – an electron will flow down the output if an electron flows in either input. An inverter is formed by a loop around which an electron flows and another group of cells which resemble a diode.

The electron in the loop escapes down the output, but is prevented from flowing through the input by the diode. When an electron enters the inverter through the input, it cancels the electron escaping down the output.

By combining an inverter with the OR gate described above, a NOR gate can be built. Then all the logic gates can be made, and many components of the computer can now be built. The one remaining component is the memory element. This again consists of a loop around which an electron can flow and escape through the output. An electron entering the 'remember 0' input cancels the electron in the loop and an electron entering the 'remember 1' input flows around the loop and escapes out of the output. A bistable could also be made out of two NOR gates but this memory element is more efficient.



The program

Listing 1 in the yellow pages allows circuits to be designed on a grid of 80 by 64 which can then be animated. To design a circuit, use the mouse pointer to point at the cell then press the left button for a wire cell, middle button for an electron-head and right button for an electron-tail. Cells can be deleted (ie, changed into background cells) by pressing SPACE.

The circuit can then be animated at two different speeds: press A for full-speed animation or F for a slower animation step by step. Animation can be stopped by pressing ESCAPE. A variety of extra functions are provided for ease of creation and editing of circuits: pressing C in edit mode clears the circuit, pressing R removes all electrons from the circuit.

When ESCAPE is pressed in animation mode the original circuit is displayed as it stood before animation. Pressing V causes the last frame to be retrieved. Circuits can also be loaded and saved by pressing L or S respectively in edit mode. This causes the directory which can be defined in line 160 to be displayed and then you are asked to supply a filename. You are then automatically returned to edit mode.

Leaving the program is effected by pressing Q in edit mode.

How it works

The program is written entirely in Arm machine code and is assembled each time the program is run. There are three main subroutines: init, design and run. The init subroutine sets up the screen and clears the area where circuits are stored. The design routine is responsible for edit mode and run

line no	Label	Description
140	.start	Main program which calls sub-routine
240	.init	Sets up display, grid and registers
1080	.design	Design routine, scans keyboard and mouse
1760	.run	Animation routine
2890	.plotgrid	Routine to plot the grid on the screen
3180	.clear	Routine to clear grid
3290	.load	Routine to load new grid
3420	.save	Routine to save current grid
3570	.getfname	Catalouges directory and gets filename
4700	.lookup	Lookup table for fast plot routine

Table 1. Routine description

causes the circuit to be animated.

Three copies of the circuit are kept in memory: original, oldgrid and newgrid. The original is the designed circuit which is retained for when animation is stopped and oldgrid and newgrid are used when in animation mode.

More minor subroutines are frequently used: for example, copy copies one circuit into another position, the addresses are passed in the 'read' and 'write' registers. The other subroutines are fairly self-explanatory.

For reasons of speed, a look-up table is used by the plotgrid routine to plot the screen. This table is calculated when the program is assembled and gives the offset from the start of screen memory. The screen memory base address obtained during initialisation which is kept permanently in the 'base' register is found using OS_ReadVduVariables and is added to this offset and the program then writes the corresponding value directly to screen memory.

Of course, there is no reason why the cells should represent wires and electrons and they clearly do not behave as such. They could also be thought of as nerve fibres with signals being sent down them. It is actually quite interesting to just draw patterns, and shaped blocks of wire cells can often produce some good effects. An example is given on the monthly disc. This program could easily be adapted to obey a different set of rules – the run subroutine counts the number of electron-heads surrounding any wire cell from line 2110 to line 2640 and the total in the range 0 to 8 is stored in the 'count' register. This is the basic function needed by any cellular automaton program. Other editing routines can easily be added by inserting lines in the design subroutine of the form:

```
1221 CMP R1,#(internal key number of key)
1222 BEQ subroutine
4351 .subroutine
4352 code for function...
XXXX B designloop
```

It is important not to corrupt any permanent registers such as the 'base' register.

The different speeds of animation are obtained by storing a value in an address in the program and is referred to as 'delay'. You can customize your own speeds therefore by changing the values stored at this address in lines 1100 and 1240. The main parts of the program are listed in table 1.

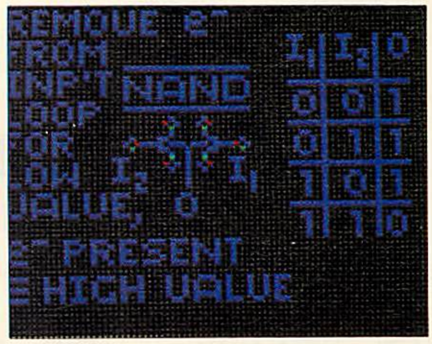
Defining circuits from sprites

Obviously it would be nice if circuits could be designed with paint tools such as circles and rectangles and filling options, instead of just having a pen which can be very slow and laborious.

Unfortunately, this would make the program excessively long and so listing 2 provides a partial answer. It converts sprites designed with *!Paint* into *Wireworld* circuits which can then be loaded and animated. Therefore all the tools provided by *!Paint* can be used to design the circuits. To do this, create a sprite for plotting in mode 1 which is 80 by 64 pixels. Use colour 0 for background cells, 1 for electron-heads, 2 for electron-tails and 3 for wire cells (it may be a good idea to redefine the colours to those used by *Wireworld* before starting to create a sprite).

The next step is to run the conversion program. First, you are asked to find the sprite file which contains any circuits. The root directory is displayed and you can search through the various echelons by typing the directory name to move up or down a level, and the disc name, drive and number to change to a different disc. Type the filename alone to load it.

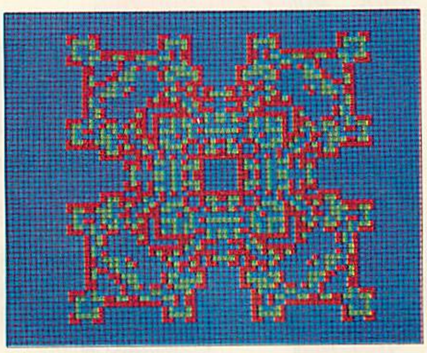
Then the list of sprites in the file will be displayed and you are asked to type the name of the sprite to convert. The sprite will then be converted and you will have to search through the filing system to find the place to save the circuit (it is probably a

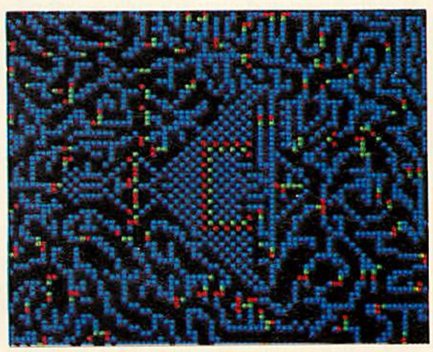


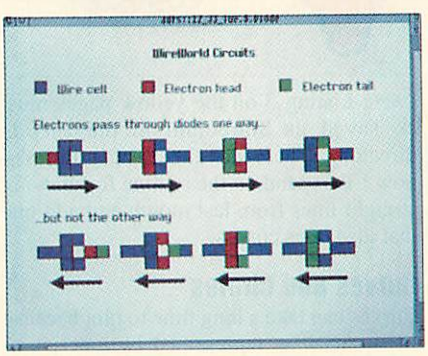
good idea to save the sprite file in the circuit documents directory).

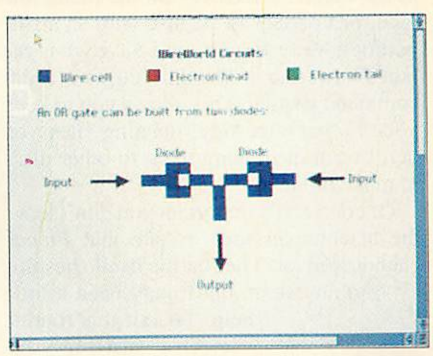
Sprites smaller than 80 by 64 will appear in the bottom left-hand corner when loaded into *Wireworld* and any sprites larger will only be partially converted to fit. Any pixels of colours other than those specified above will be interpreted as background.

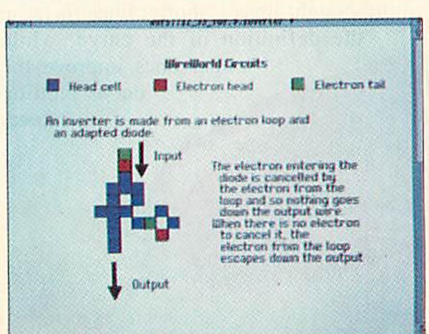
An opportunity will be given to convert another sprite from the same file, to load a new file or to quit. The program only works one way so the sprite files should be saved in case any major editing of *Wireworld* that cannot be done easily is needed.

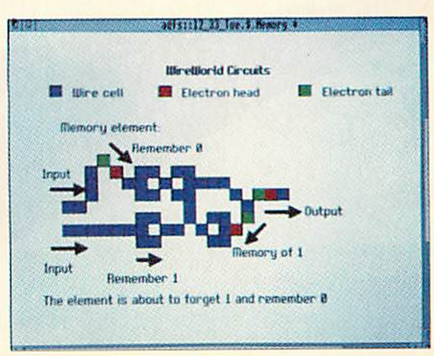












DRAWING ATTENTION

To increase your drawing power, **JAMES RICHARDS** adds some useful utilities to his Picpac graphics package



Last month I explained how I put the bones of my *Picpac* graphics package together and provided a program that allowed you to draw lines on the screen. This month I have added some more utilities, not only to draw screens, but to keep your *Picpac* disc in order.

The load routine simply catalogues the selected modes directory and then asks for a filename to load. The file is then loaded into the screen and saved as 'Wkfile'. When you go into rubber banding, this new screen will be loaded for you to work on.

The save screen facility works in the opposite way, ie, it asks for a filename to save under and then saves the workfile under this name. Both these routines could be replaced by a simple *COPY command, although there would be compatibility problems.

Utilities

Listings 1 and 2 on the yellow pages should be saved as LoadScr and SaveScr in the *Picpac* directory. On the menu, the icon for LoadScr is the disc with an arrow pointing away from it, and SaveScr is the other way around. The third utility is a star command routine. This allows you to keep your *Picpac* disc tidy, deleting files you don't want or moving them to other discs to make room.

Of course, it's important you don't leave the machine in such a state that *Picpac* cannot recover. The routine itself tries this to an extent, but it may need a little help. To exit this routine just press ESCAPE. Listing 3 on the yellow pages must be saved as Starcomm in the *Picpac* directory. These are the basic utilities – now I'll expand on the routine for drawing straight lines from last month and add one that also does curves.

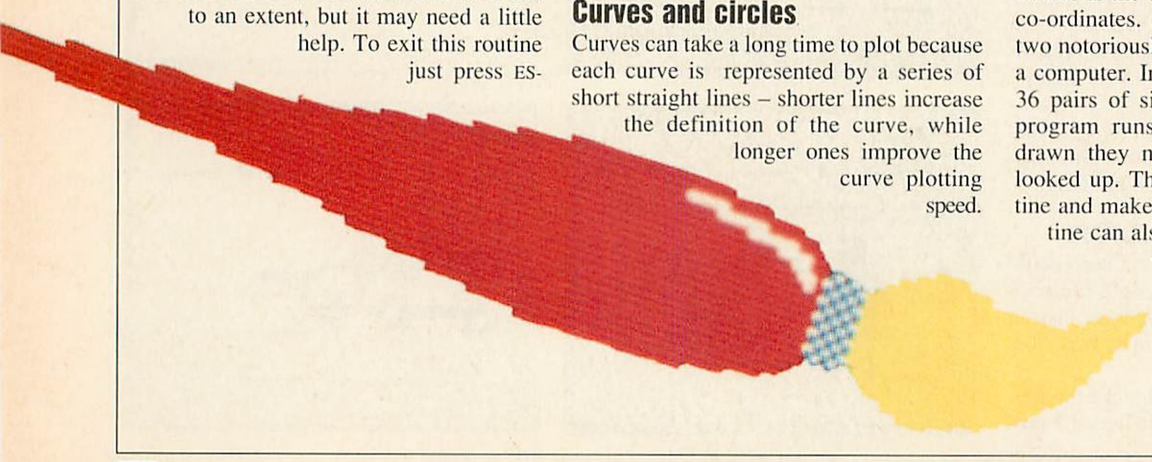
Curves and circles

Curves can take a long time to plot because each curve is represented by a series of short straight lines – shorter lines increase the definition of the curve, while longer ones improve the curve plotting speed.

The happy medium is to make a circle up of 36 lines, ie, at 10 degree intervals. This plots the circle at a satisfactory speed without being blatantly obvious that it is in fact a 36-sided polygon.

Another factor in the speed of drawing circles is the time it takes to calculate the co-ordinates. Sines and cosines are used, two notoriously taxing pieces of maths for a computer. In my routine, I calculate the 36 pairs of sines and cosines before the program runs – then, when a circle is drawn they need not be calculated, just looked up. This speeds up the circle routine and makes it 'usable'. The circle routine can also do ellipses because of the way the cursor works.

When the program first runs, a small cross is shown – this shows the x and y dimensions of the circle. You can move the cur-



sor about using the standard direction keys Z X : and / but, if you hold down SHIFT the functions of these keys are changed. They now adjust the dimensions of the cursor with Z and X, increasing and decreasing the x-axis and vice versa for : and /.

Pressing RETURN will plot the curve in the current colour. The cursor also indicates if the two axes are equal by plotting it using dotted lines – in this case a circle will be drawn. Of course, you will also need to fill circles – this can be achieved by pressing F, and the diamond on the display line indicates the current state.

Fills and arcs

The fill is achieved by plotting triangles from the centre. If you wish to test your circle out before plotting it, just press the space bar, and then any other key, to remove it again.

Arcs can also be plotted – by pressing C, a small cross appears, which can be moved around the circle by using the left and right keys, with RETURN used to plot. Pressing DELETE exits compass mode. Enter listing 4 on the yellow pages and save it as Curves in the *Picpac* directory. You can now select it with the circle icon.

Text routine

Being a graphics package, I didn't feel the need for a DTP-like text routine. The one I have supplied here simply inputs text at the cursor and then plots it in the current colour. It is only really any good for labelling, although many different effects can be achieved. Enter listing 5 and save it as Text in the *Picpac* directory. The text icon is the one with pen and paper.

When the program is first run, a small vertical bar presents itself. This is the text cursor and can be moved around with the standard direction keys, with SHIFT to speed it up. Pressing the space bar allows you to type your text. Press RETURN when done and you are presented with some options: You can either leave the text exactly as it is shown by pressing L; pressing R will rub the text; pressing P will plot it in the current colour, and pressing C will centre it on the centre line (the dotted vertical line). You may move this centre line by pressing C once and then using Z and X to move it left and right. Pressing C again will centre the centre line.

If you centre your text you have the same three options as before – 'L'eave, 'R'ub, 'P'lot. Interesting effects can be achieved by plotting text over other text, with a slight offset. For instance, a drop shadow can be made by plotting text in red, and then plotting the same text over in yellow and offsetting one pixel in X and Y directions.

The final routine this month is copying. Again, copying routines are notoriously slow. If an area 50 x 50 pixels is to be copied, then the computer has to deal with 5000 pixels. My routine uses screen memory to copy – it certainly beats most other copying routines, but it has limitations, as you will find out.

What it does best is shift small parts of the screen around and I find it very useful for designing sprites and circuit diagrams among other things. It is listing 6 in the yellow pages. Save it as Copy in the *Picpac* directory.

When it is selected, a small box will appear in the middle of the screen when you use the copy icon (that's second from the left on the top row). You can move this box around and re-size it by holding down SHIFT. Press the space bar to select the region to be copied, then move the box to where you want it to go and press RETURN. The area will be copied at a rate of knots.

Next month I will add a printer dump and fill routine, and explain how to add your own graphic creations to the *Picpac* user directory.

HOW TO SAVE YOUR LISTINGS

Listing - 1 LoadScr
Listing - 2 SaveScr
Listing - 3 Star comm
Listing - 4 Curves
Listing - 5 Text
Listing - 6 Copy

KEYS FOR CURVES

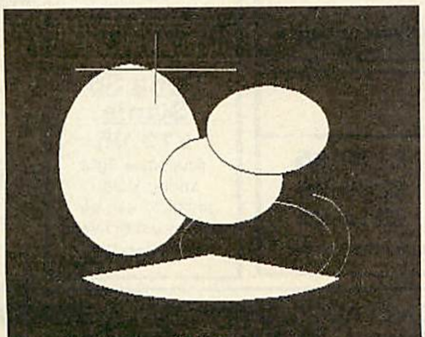
Z X / : - Move Cursor Hold down SHIFT with these keys to adjust axis
SPACE - Test Curve
RETURN - Plot Curve
F - Toggle Fill
Cursors left and right - Adjust colour
Press C to enter compass mode and then :- Z X - Move around circle
RETURN - Scribe line
DELETE-Exit compass mode

KEYS FOR TEXT

Z X : / - Move Cursor
SPACE - Enter text
C - Adjust centre line then RETURN to set

KEYS FOR COPY

Z X : / - Move box
SHIFT - Adjust size of box
SPACE - Get area
RETURN - Copy area



Possible text variations



Curves and circles can be plotted easily

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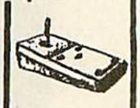
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amaDIEus

A musical dice program for the Hybrid music system by **IAN WAUGH** (with inspiration from Mozart)

One of the earliest experiments in computer composition took place in the late 1950s and resulted in the *Illiac Suite*, a set of pieces composed by a rule-based system. Another program analysed the works of Stephen Foster (who wrote *Camptown Races*, *Oh Susannah* and *Old Folks At Home*, among others) and churned out compositions in his style.

There are a few commercial computer composition programs but none, alas, for the BBC or Archimedes. All, to an extent, rely on the random number generator and the more randomness or 'choice' you give the computer, the less structured and the less stylised the piece will be.

While the rules of harmony can be put under a microscope, examined, dissected, put back together again and stuffed into a computer, the rules of melody are rather more elusive. Harmony is based on mathematical relationships, but melody relies more on the whim of the muse.

Roll the dice

Interest in automatic composition systems goes back much further than the middle of this century. It is rumoured that Mozart (1756-91) devised a system of automatic composition which was published two years after his death. His *Musical Dice Game*, or *Musikalishe Wurfelspiel*, allowed the user to compose waltzes by throwing a couple of dice. The throws were used to select bars of pre-written material, which slotted together like pieces of a jigsaw. Unlike a jigsaw, however, the bars had to be written in such a way that one could follow on from another and still make musical sense.

However, there are some music authorities who doubt that Mozart had anything to do with the *Musical Dice Game*.

Regardless of who devised the system, I have enlisted the help of Herr Mozart to construct a musical dice program for the Hybrid Music System. The program is open to further development and input from the user and we'll look at ways of modifying it later. First, this is what it actually does.

Following Mozart's guidelines, the music material consists of six lines each of eight bars of music (Mozart's game actually had more bars). The diagram shows the arrangement in table form – 3tune4, for example, is the fourth bar of tune three. To select the first bar, roll a dice (for the purists, I never say die!) and select a bar from column one. Roll again and select a bar from column two and so on until you have eight bars. Most musical phrases or statements are eight bars in length.

So far, so good. As mentioned earlier, however, the trick lies in writing bars of music which can follow on from each other. I have used the first eight bars of six well-known Mozart pieces and, for the most part, they fit together very well. The extent to which they do this, it must be said, is more due to good fortune than careful planning, although I did have the sense to enter them in the same key! All you have to do is type it in (buying the monthly disc will save a lot of sore fingers) and run it.

The program

The program is fairly straightforward although it uses a couple of interesting techniques. Even though the six tunes are relatively simple, most are too complex to program in one music part without a lot of calculation and effort. They are derived from piano arrangements and I have therefore created separate treble (right-hand) and bass (left-hand) parts for them. For example, 1t1 and 1b1 together make up the first bar of the first tune.

In order to play these two sections at the same time, use the P(...)P construction which instructs a player to execute the enclosed sequence of instructions. For example, from the tb1 word, the following:

```
2P( 1t1 )P 1b1
```

tells player 2 to play 1t1. As tb1 is called by part1, 1b1 plays on player 1, so the treble and bass parts play together. If you can work out an easier way of combining the two parts, please let me know.

part1 does the dice throwing and rand returns a random number between one and six, which is passed to the tb words to get a bar of music. The number is compared with the values one to six in turn and, when it finds a match, it plays the music.

Each tune actually has an extra bar which I've called the end bar. In part1, after bar seven the program uses INDEX to check if this is the last time through the loop. If it is, then an end bar is played, called by the tbe word. If it's not, the last time through the loop will give the program a chance to use an end bar, just to add a little variety.

Two other words worth mentioning are cls and press which are useful when constructing info words.

Custom Mozart

The first thing you may want to do is alter the mix. I've used Upright for all the parts – as they are based on piano arrangements.

As the piece only uses three voices, you can rope more in to thicken the sound by creating instruments which use more than two channels. Alternatively, you could combine instruments or make one instrument call and use another, so doubling the sound. You can also add Echo, bearing in mind it doesn't work with chords. If you have the Music 2000, it's an easy matter to play the parts via MIDI.

The second thing you may want to do is try your hand at writing your own bars of music. One way to do this is to work out a chord sequence and use it across all six pieces. Although the results will sound fine, they will probably be a little predictable. For additional interest you really need a range of alternate harmonies. If you do devise an interesting alternative set of bars, please send them in. You'll notice that all the parts have been entered on the stave to make them easy to examine and alter.

Incidentally, if you want to hear the six tunes on their own, simply define rand with the values 1 to 6 in turn like this:

```
"rand" [ 1 ]
```

Before you start experimenting it's worth noting that the program contains 125 words which is the maximum allowed by the Hybrid music system.

If this area interests you, then it's worth looking at these three books – Exploring Music with the BBC Micro and Electron *by Kevin Jones (£9 .95 from Pitman),* Creative Sound *by David Ellis and Chris Jordan (£9.95, published by Acorn) and my own book* Making Music on the BBC Computer.

	Bar Number							
Dice Throw	1	2	3	4	5	6	7	8
1	1 tune 1	1 tune 2	1 tune 3	1 tune 4	1 tune 5	1 tune 6	1 tune 7	1 tune 8
2	2 tune 1	2 tune 2	2 tune 3	2 tune 4	2 tune 5	2 tune 6	2 tune 7	2 tune 8
3	3 tune 1	3 tune 2	3 tune 3	3 tune 4	3 tune 5	3 tune 6	3 tune 7	3 tune 8
4	4 tune 1	4 tune 2	4 tune 3	4 tune 4	4 tune 5	4 tune 6	4 tune 7	4 tune 8
5	5 tune 1	5 tune 2	5 tune 3	5 tune 4	5 tune 5	5 tune 6	5 tune 7	5 tune 8
6	6 tune 1	6 tune 2	6 tune 3	6 tune 4	6 tune 5	6 tune 6	6 tune 7	6 tune 8

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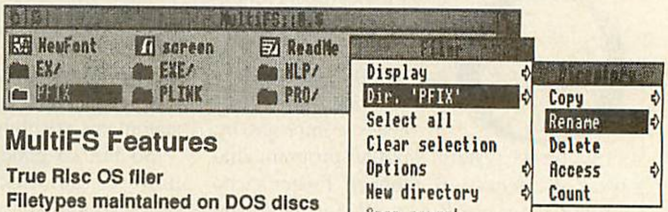
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MultiFS

MultiFS provides the Archimedes with multiple filing system support. This new filer allows the user to read and write to non standard Archimedes discs from within the desktop enviroment. Current formats supported :

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- ☆ Atari DOS
- ☆ BBC DFS

This filer allows access to any hard disc partitions for the PC Emulator, and allows the user to treat PC discs in exactly the same manner as ADFS discs.



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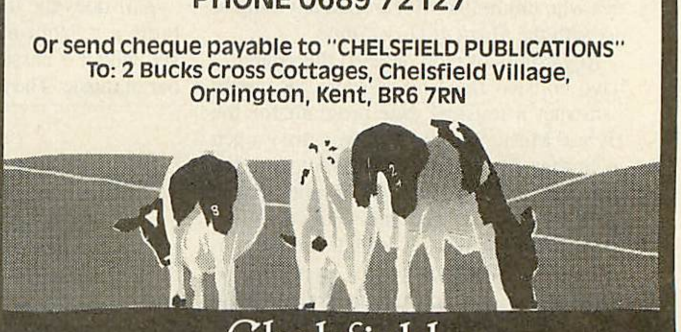
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New horizons

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Acorn is to hold a major four day end-user conference running alongside this year's Computer Shopper Show.

It has been designed to bring computer users bang up to date with technology and what the company's renowned research and development team has achieved of late. Attendees will also be provided with a fascinating glimpse into the future of computing.

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But don't leave it too late. Conference tickets are limited and will be allocated on a first come, first served basis.

Ensure your seat by completing and returning your application form TODAY.

Timetable of events

THURSDAY AND FRIDAY

11.00 - 11.50 am
CD ROM IN EDUCATION
Speaker - *A spokesman for Next Technology.*

VOUCHER WORTH £50 for a Next Technology CD Rom Drive

12 NOON - 12.50 pm
SCHEMA - A SPREADSHEET FOR THE FAMILY
Speaker - *David Clare.*
He has worked in the computer industry for more than nine years and is best known as the head of one of Acorn's longest standing third party software houses, Clares.

VOUCHER WORTH £30 for Schema

1.00 - 1.50 pm
IMAGE PROCESSING
Speaker - *Malcolm College.*

VOUCHER WORTH £40 for Wild Visions V9 Digitiser

2.00 - 2.50 pm
PC EMULATING AND OTHER OPERATING SYSTEMS
Speaker - *Ian Lynch.*
An expert on a variety of operating systems including IBM's PS2, MS dos, Unix and Risc OS, he is the curriculum development director for the City Technology Colleges Trust. In this role, he is responsible for supporting and developing curriculum innovation within colleges throughout the country

VOUCHER WORTH £30 for Acorn PC Emulator

3.00 - 3.50 pm
MUSIC-MIDI-MANIA
Speaker - *Mike Beecher.*
A graduate of the Royal College of Music, he is the managing director of ElectroMusic Research.

VOUCHER WORTH £30 for EMR Studio 24

4.00 - 4.50 pm
RISC TECHNOLOGY IN THE 1990's
Speaker - *Mike Muller*
A key memberof the Acorn Risc development team.

VOUCHER WORTH £25 for Programmers Ref. Manuals

5.00 - 5.50 pm
DESKTOP PUBLISHING
Speakers - *Martin Chappell and James Lynn.*
Martin Chappell is the Art Editor of Car Magazine, the largest publication of its type in the UK.

James Lynn is one of the chief designers and programmers on the Impression development team at Computer Concepts.

VOUCHER WORTH £30 for Impression 2

SATURDAY AND SUNDAY

11.00 - 11.50 am
HYPERMEDIA FOR ALL
Speaker - *David Tee.*
The author of two of the original programs on the first welcome tape for the BBC Micro, he is the man behind the Genesis project.

VOUCHER WORTH £20 for Genesis

12.00 noon - 12.50 pm
SCHEMA - A SPREADSHEET FOR THE FAMILY
(See details as for Thursday and Friday)

1.00 - 1.50 pm
PROGRAMMING MADE EASY WITH BASIC 5
(Including Dabs Compiler)
Speaker - *David Atherton.*
A co-founder of Dabs Press, he is well known as a regular contributor to leading computer titles.

VOUCHER WORTH £30 for a Dabs Press ABC Compiler

2.00 - 2.50 pm
PC EMULATING AND OTHER OPERATING SYSTEMS
(See details for Thursday and Friday)

3.00 - 3.50 pm
MUSIC-MIDI-MANIA
(See details for Thursday and Friday)

4.00 - 4.50 pm
FASTER COMPUTING - *all the expansion options for the Archimedes*
Speaker - *Alex Van Someren.*
The technical director of Aleph 1, producers of the first commercially available ARM 3 upgrade, he will demonstrate the full potential of the Archimedes and discuss future possible enhancements.

VOUCHER WORTH £50 for Arm 3 upgrade

5.00 - 5.50 pm
DESIGNING DOCUMENTS WITH THE HELP OF A COMPUTER
Speaker - *James Lynn.*
A leading light in desktop publishing technology, he is a chief designer and programmer at Computer Concepts.

VOUCHER WORTH £30 for Impression 2

Getting to the conference

Getting to Wembley Conference Centre is easy. All roads leading to the site are well signposted and the Centre is well served by buses and the tube (Jubilee & Metropolitan lines).

Conference registration

Complete the registration form below. Sessions are priced at £7.50 each on Thursday and Friday and £5 each on Saturday and Sunday. Or buy a "Rover ticket" and attend all sessions - £30 per ticket for Thursday or Friday - £15 per ticket for Saturday or Sunday.

Entrance to the Computer Shopper Show at the door is £5 for adults and £3.50 for under 16's, but for Acorn conference delegates only we are offering a reduced rate at £3 per adult and £2 per child. "Rover ticket" holders get in free!

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- ☐ Risc technology in the 90s
- ☐ Desktop Publishing

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- ☐ Schema - A spreadsheet for the family
- ☐ Programming made easy with Basic 5
- ☐ PC emulating
- ☐ Music-Midi-Mania
- ☐ Faster computing
- ☐ Designing documents with the help of a computer

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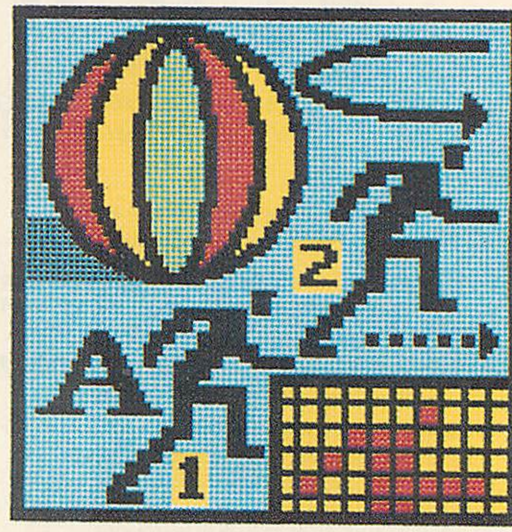
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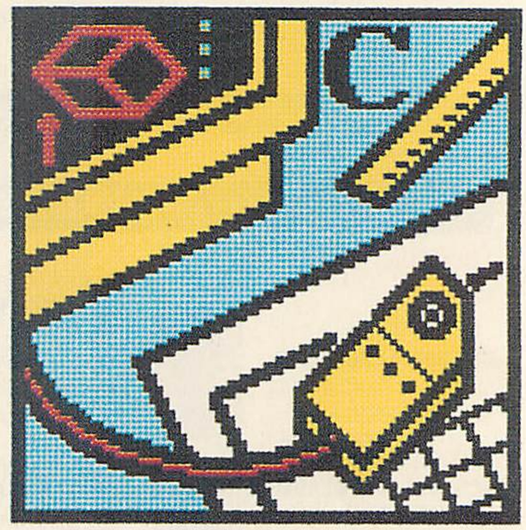
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A-GRAP

Computer graphics have a associated jargon. **ROB MILLER**





Animation is perhaps one of the most exciting areas of computer graphics. Computer display technology has now reached a point where photographic reproduction is possible, so the next step is to get moving realism. The use of computers in simulators has advanced the various techniques substantially, although it will still be some time before you see genuine real-time, photo-quality animation.

(Also, don't forget one of Greece's most famous mathematicians who has had a certain range of computers named after him!)

Computer graphics, by and large, come in two varieties. They can either be an object-based description such as a Postscript file, or in the form of a sprite or **B**itmap. A bitmap, as its name suggests is a two-dimensional 'plan' of a group of pixels. Each pixel may be sub-divided, depending on the number of colours contained in the overall graphic. There is no standard method for storing bitmaps in computers, giving rise to the need for conversion programs such as *!ChangeFSI* on the Archimedes.

Initials and acronyms spring up all over the place when reading through any vaguely technical piece on computing. Go into any modern drawing office these days and you'll see and hear the words **C**AD and CAM wherever you look. CAD is simply computer aided design and CAM, is computer aided manufacturing. Both terms can be embraced by the term CAE – computer aided engineering.

CAD, the more common of the three, is a major use of computer graphics. It encompasses everything from simple line drawings, to modelling of complex objects such as jet engines. *AutoCAD* is perhaps the most famous small computer CAD package. A cut down version called *Autosketch* is available for the Archimedes.

Digitising covers any process by which an analogue signal is processed to form a digital equivalent. In the case of pictures, a computer will scan a signal and convert each readable point into something that can be displayed on screen. In a typical black and white photograph there is literally an infinite number of shades of grey, which would be impossible to show on a computer screen. If the computer can display 16 shades (like the Archimedes), it must group near-shades together and make them one colour.

Dithering (sometimes used in digitising to achieve shading effects) involves placing different coloured pixels together in an X shape, to give the effect of a colour somewhere between the two originals. Of course, the higher the resolution (the number of pixels from top to bottom and across the screen), the more realistic the 'new' colour will look. These groups of pixels are often referred to singularly as a super-pixel.

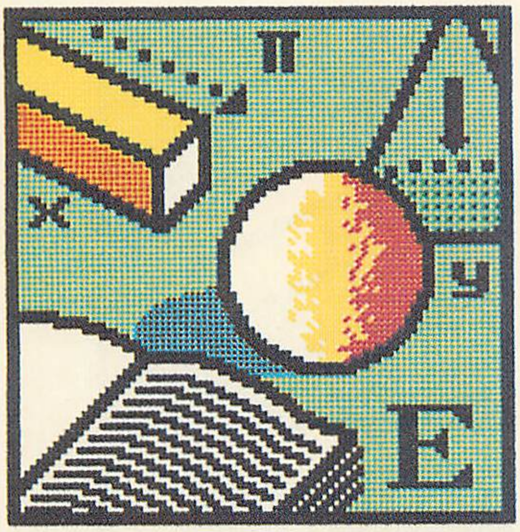
The Greek mathematician **E**uclid was a forerunner of Archimedes and is responsible for much of today's geometry. His work was so important that it still forms the basis of the subject. A book by him called *Elements of Geometry* was one of the major texts to arise from the Greek philosophical/intellectual group of people.

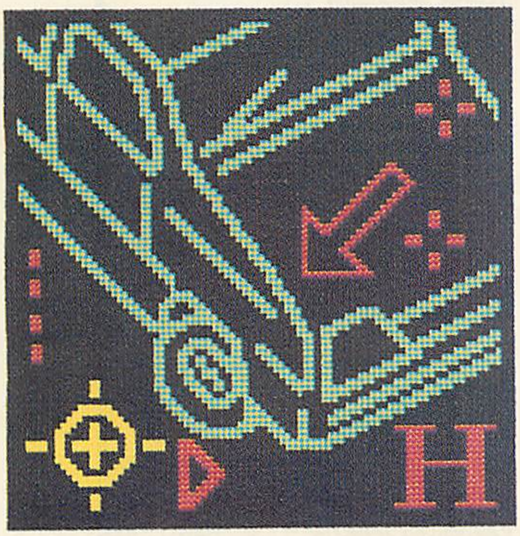
Realism in computer graphics can be achieved in a number of ways. Either by copying an object exactly by measuring all its dimensions, or by finding an algorithm that can be used to simulate it in some way. **F**ractals involve the constant application of an equation on a number of points. A variety of patterns can be created, depending on how the results are interpreted.

One of the most famous fractal patterns is the Mandelbrot set, discovered by Professor Mandelbrot. The now-famous set has an infinite depth and it is therefore possible to zoom in and in ad-finitum. The way in which fractals appear closely resembles the real things in nature – such as coastlines – and it is now possible to simulate convincing geography, purely from mathematical equations.

GKS (Graphics Kernel System) is an established graphics description language, popular on large computer systems. Defined in 1979, GKS was proposed as a standard by which graphics could be produced on any supporting machine. It is now one of the three largest systems used throughout the world.

A library provides all the procedures and functions needed to manipulate the lines, curves and points that form a graphic. One major point of GKS is that it is a modular system, making





-Z

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it easy to transfer graphics between different machines.

GKS is entirely object-based as opposed to bitmap orientated. A box, for example might be described as a set of four co-ordinates joined together by lines. Objects can be grouped together to form larger objects and these in turn manipulated (ie, rotated) as a single entity.

Postscript and HPGL are two of the closest similar standards on microcomputers.

Before programs such as *Zarch* came along, all solid graphics on microcomputers were produced using wire-frame (straight lines indicating the edges of an object) graphics. In order to give graphics a more solid feel, lines are removed when they fall behind a nearer face of the object. The method is called, strangely enough, **H**idden-line-removal.

Once an object is stored in the computer as a series of three-dimensional co-ordinates, lines can be sorted in order, depending on where they fall in the line of vision. A typical algorithm will move through the lines (from back to front) and draw the last one it finds, ie, the front one.

With the power of the Archimedes, solid three-dimensional graphics are possible. In this case, a similar technique is used although here it is known as hidden-face-removal.

Animation has greatly benefitted from the application of computer graphics. Various methods can be used to aid and speed up the job of creating individual frames. In the past, an animator would have had to create individual frames by hand, drawing each one on a separate sheet of acetate. Getting a smooth sense of movement was particularly difficult.

In-betweening allows the animator to draw a start frame and a stop frame, and the computer will fill in the frames in between. If a more complex motion is required, any number of the middle frames can be input by hand, making exact movement possible.

An in-betweening program for the Archimedes was carried in the June 1988 issue of *BBC Acorn User*.

The method by which graphics are entered into a computer is largely governed by the application. Mice are common now for most systems although **J**oysticks have always been popular as an input device, particularly for entertainment purposes.

Before the mouse, joysticks were mainly used for CAD. One program in particular, *Bitstik 2* required the use of a three-dimensional joystick that allowed control in the x, y and z axes (by rotating the stick itself). It ran on a BBC micro with 6502 second processor and twin disc drive and implemented remarkably advanced features for its time.

Over the years, a number of curves have been discovered that rely on fractal mathematics. The **K**och Curve, whose algorithm was discovered by Helge von Koch in 1904, is among the more common derivations. The Koch or 'snowflake' curve relies on recursion for its construction. The same algorithm can be applied to a straight line to produce a Koch landscape or forest.

As mentioned above, a number of languages have appeared throughout the years to control the use of graphics on computers. Perhaps the most commonly found on a microcomputer is **L**ogo. Aimed mainly at teaching and education, Logo is based around the ability to move a cursor or pointer around the screen, leaving a trail if and when required.

When hardware such as turtles and buggies became available, Logo was extended to control external devices. Robot control languages were soon written with Logo forming their basis.

The BBC micro, because of its strong education bias, became a popular choice for Logo and there are now a number of different software and hardware options available.

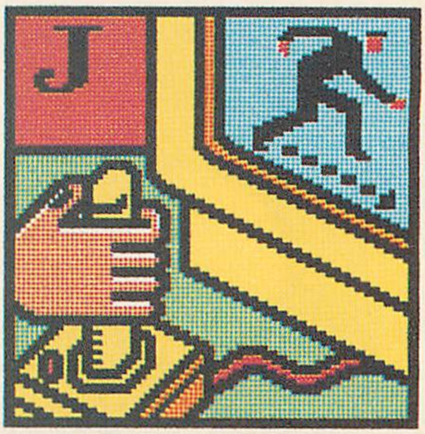
Mandelbrots are now common wherever you look. With the recent acid-house boom, these psychedelic patterns appeared on everything from T-shirts to pop videos. What appears to be a mass of pseudo-random colour is actually a visual representation of a mathematical formula.

The whole Mandelbrot set has an infinite depth, that is, that at any point, you can zoom in and see more of the pattern.

Numerous programs to produce the Mandelbrot set have been carried in *BAU* over the past years. The BBC micro was catered for recently in the August issue and Archimedes owners can look out for Stephen Streater's latest one second (or less!) wonder in the public domain.

Even areas within the terms 'computer graphics' have their own jargon. One word that

comes up in image processing a lot is Noise. Obviously in this case, it does not refer to sound, but to incorrect pixels (usually) on a digitised picture.

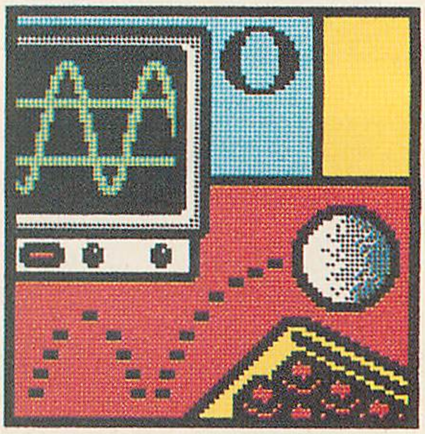


Various techniques exist to overcome this, such as pixel averaging, and are used mainly in the field of picture enhancement, ie, astronomical photography.

Perhaps the earliest use of electronically-generated graphics is the Oscilloscope. Popular opinion is that the first computer graphics were not intentional, but the result of hooking up oscilloscopes to monitor machines that were primarily designed for calculation. One of the first graphics demos was seen on the American Whirlwind computer in 1951. It involved the simulation of a bouncing ball and its trajectory, displayed on an oscilloscope.

The realisation that a 'picture' could be generated led to more complex displays being developed and computer graphics were born.

For some reason, most of the common graphics words fall under the letter P, so a brief explanation of each will have to suffice.



The word Pixel is a shortened version of picture element. The number of pixels on screen determines the graphics resolution of the computer.

Postscript is an object-based graphics description language, developed by the American company Adobe. It is primarily used to control laser printers, although it can be useful as a standard for transferring files between different makes of computer.

Parralax scrolling involves different 'planes' in a picture being moved at different speeds. *Elite* used it with left and right views out of the ship to give a sense of depth. More modern games, especially those in arcades, employ parallax scrolling to give pseudo 3D.

No A-Z would be complete without mentioning the first computer game, *Pong*. Consisting of just a bat and ball, *Pong* was responsible for the whole arcade industry as it is today. If only we'd known then what we do now .....

One of the most common names mentioned in connection with professional graphics systems is Quantel. This company is responsible for the famous Paintbox system, which can now be found in most modern video effects suites.

It's a very expensive system, so it is only for studios, although continuous development of micros such as the Arc should give it a bit of competition in a few years time.



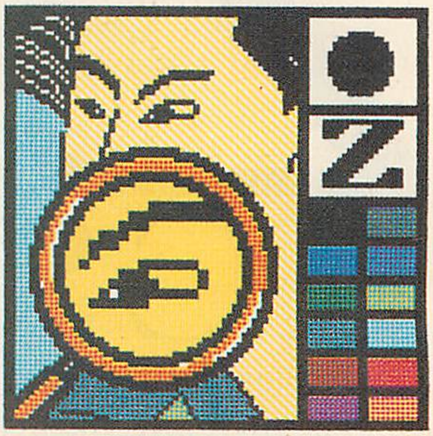
With the advent of 16/32-bit computers, Ray tracing has become one of the leading areas of computer graphics. Based on a mathematical algorithm, it allows you to design a 'scene' containing solid objects that can be of any material, depending on the complexity of the program. Transparent, opaque and mirrored objects are usually supported.

Ray tracing works by calculating the direction of light in the scene and deciding where it will eventually fall. Because of the complex nature, a single scene can take anything from a few minutes to a few days (running on an Arc).

Animation companies, such as Pixar, design specific hardware on which to run their own ray tracing software. Examples of their work can be seen in film, television and advertising.

Simulation has to be the largest use of computer graphics in industry today. Everything from medicine to avionics is aided by computer modelling of real-life situations.

Flight simulators are commonplace these days, especially as an entertainment medium on home computers. However, there are simulators for virtually every other type of transport you can imagine.



Modern architecture/engineering utilises simulation to quite an extent. Buildings can be designed on a computer as a set of plans, and the computer can then be used to produce a solid perspective model on screen. Shading effects can be added to natural or artificial light.

In bridge building, computers are used as what-if tools. Computer models of bridges can be loaded with excess weight or stress and results compensated for by re-design.

Trigonometry and Transformations form the basis of all solid Three-dimensional graphics. Solid vector graphics involve the storage of three-dimensional co-ordinates in matrices. In order to manipulate (ie, rotate, enlarge) shapes, transformation matrices are applied. The maths can be rather complex, so read books such as Foley & Van Dam's *Fundamentals of Interactive Computer Graphics*, among others.

A-Z GRAPHICS

Tron deserves a mention for being one of the first full-length films to include computer generated graphics. Made in 1982, *Tron* featured a mixture of computer generated and hand-drawn animation, as well as the inclusion of real-life actors.

The speed at which real-time animation (ie, frames that are calculated as you see them) occurs on a computer is known as the **U**pdate or frame-rate time. Like cinema film, animation only requires about 25 frames per second to convince the viewer that he or she is seeing a continuous piece of action.

As mentioned above, **V**ectors are the basis of most 3D graphics. Officially defined as 'any physical quantity requiring a direction to be stated in order to define it completely', in computer graphic terms, vector is used more loosely.

True vector graphics use a special display where only visible lines are drawn directly onto the screen, as opposed to raster scan images (like television) where the whole picture is drawn from top to bottom.

Games such as *Asteroids* and *BattleZone* make use of vector graphics. When more powerful computers arrived, the mathematics used were then developed to include solid shapes, seen in games such as *Zarch*. Although *Zarch* uses vectors, it does not employ vector graphics.

Elite was seen as many to be a milestone in computer games history and was notable for its use of **W**ire-frame graphics. Before 16/32-bit computer technology, outline or wire-frame graphics were the only practical way of animating solid objects in real-time. (See also hidden-line-removal and vectors).

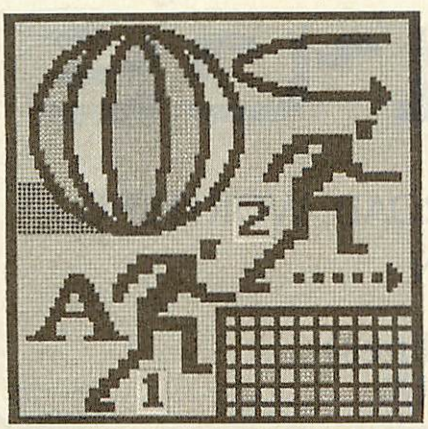
Standard co-ordinate geometry uses two axes, one horizontal and one vertical. The horizontal axis is often called the **X**-axis.

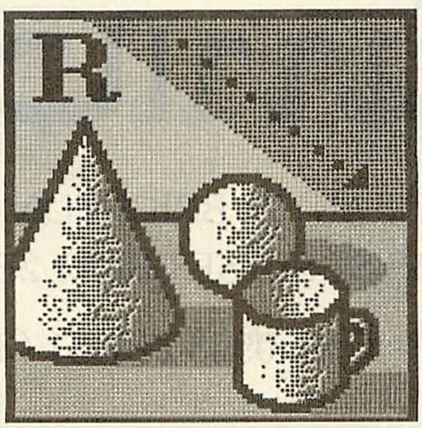
Movement in 3D space (especially that employed in flight simulators) is referred to in terms of pitch, roll and **Y**aw. Yaw is the rotation of an object (typically a satellite) about an axis that joins that object to the centre of the earth.

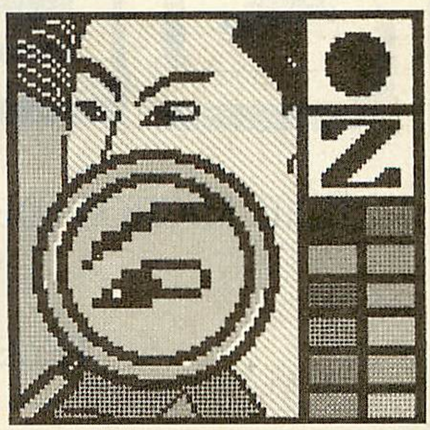
Any computer graphics package worth its money should include a **Z**oom option. As its name suggests, it is used to enlarge an area of a picture to make editing easier and more accurate. In the case of an object based program (such as *!Draw* on the Arc), it is often needed, as a standard monitor cannot display all the detail in a picture. Imagine trying to show an A0 size drawing on a 14in display.

On a different note, the depth-sort algorithm mentioned under hidden-line-removal is also known as the Z-buffer algorithm.

I'm sure there are plenty of associated words that I've left out and would be interested to see alternative entries, or even complete lists.







HACK A STACK

JASON O'BROIN's series on programming the Arm2 Risc chip continues with multiple register data transfer

It is often necessary to store a group of registers in memory so that they can be used for another purpose (for example, in a subroutine). Storing each register individually using STR is inefficient in terms of memory usage, and short of writing self-modifying code, you can't use a loop to store each register in turn. As a result, the two instructions STM (store memory) and LDM (load memory) are provided.

STM works by storing the list of registers given after the mnemonic into memory, starting at the address specified in the base register. How multiple store works is dictated by extra parameters which follow the STM instruction. The format of the STM instruction is:

```
STM{cond}<type> <base>{!},
<register list>
```

Stacks

Stacks can be described by drawing an analogy with a stack of dirty plates. Plates can only be added to or removed from the top of the stack. To remove the third plate down, the two above it must be removed first (and then placed back on top afterwards). A plate cannot be removed before all the ones on top of it.

Stacks in a computer work on an almost identical principle. Consecutive memory locations act as the spaces for the data, with a couple of minor considerations.

The first is whether the stack is ascending or descending through memory, that is to say whether the next item on the stack is at a higher or lower memory location than the current one. The second consideration determines how the end of the stack is marked – the stack pointer can either point at the last item (a full stack) or at the next free space (an empty stack).

To specify which type of stack to use, place a couple of letters after the mnemonic. So, for example, to use a full ascending stack, use:

```
STMFA R13!,{R0}
```

while for an empty, descending stack use:

```
LDMED R13!,{R1}
```

When programming for the Archimedes, all internal stacks are of the full, descend-

NOTATION 1	NOTATION 2
STMFD	STMDB
LDMFD	LDMIA
STMFA	STMIB
LDMFA	LDMDA
STMED	STMDA
LDMED	LDMIB
STMEA	STMIA
LDMEA	LDMDB

Figure 1. Equivalence of stack modes

ing type, and hence the FD form must be used for everything except your own stacks.

There is an alternative notation that you are likely to come across at some point. For example, the resident debugger uses this alternative format in its disassembler.

The alternative notation is I/D (increment/decrement), and B/A (before/after). So, IA means increment after a register transfer (post-incremented), while DB means decrement before a register transfer. The problem with this notation is that the form of adding is the exact opposite of that for removing. Figure 1 shows the equivalance of the two notations. This notation mirrors the operation of the microprocessor more closely, and which form you use is largely a matter of personal taste.

To update the stack pointer, suffix the base register with a pling! once the data transfer operation has taken place. Use the data transfer instructions for stack management, or as a simple multiple register transfer function. So, to store all working registers on the stack pointed to by R13, use:

```
STMFD R13!,{R0-R12}
```

while to load a continuous block of data, starting at the label 'block' into registers r0-r6 (say) use:

```
ADR R6,block LDMIA R6,{R0-R6}
```

The IA form makes it obvious that you are ascending through memory, incrementing the base value after each register has been loaded. The new value of the stack pointer after the load is completed will not be written back to R6, which will have been overwritten with a value from the block of data.

Other considerations to be taken into account with this type of register transfer include the order in which the registers are stored in memory. The order in which the registers appear in the register list is completely irrelevant. When storing registers, the Arm ensures that the lowest numbered register is stored at the lowest memory location, with the other registers stored in numerical order above that.

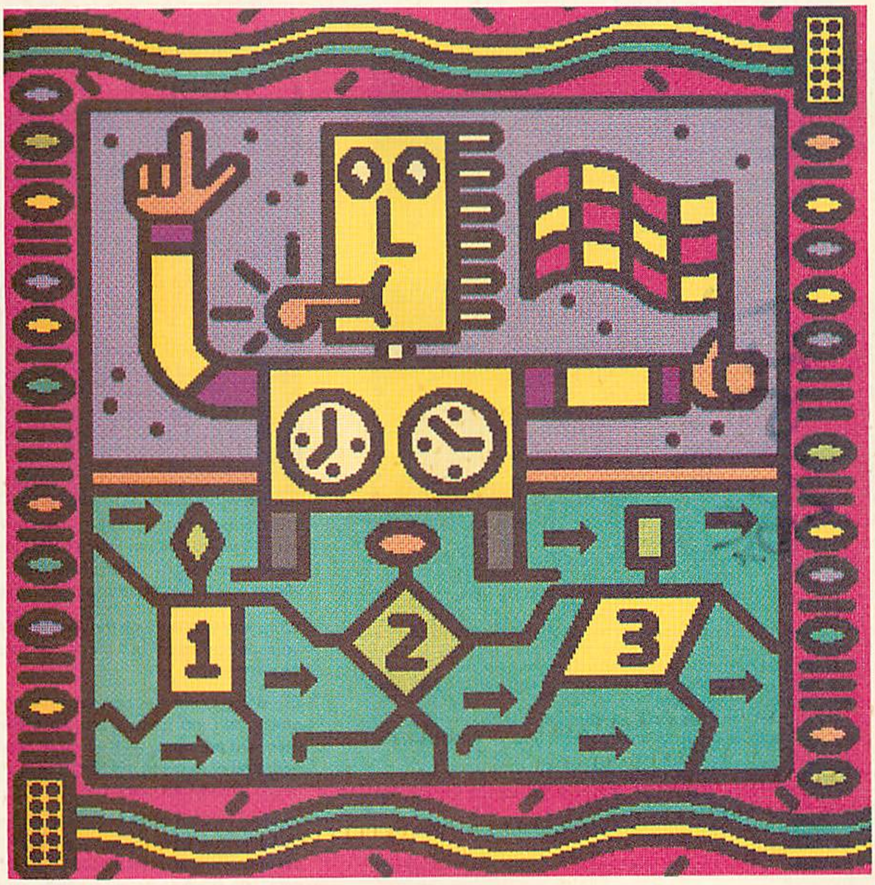
When storing the base register itself onto the stack (using write back), the value stored depends on the register's position in the list. If the stack pointer is the lowest numbered register in the list then the original value is stored, otherwise the value stored is the written back value.

Loading registers

The LDM command works in a similar manner to STM, the only major difference being what happens when R15 is loaded. All 32 bits are stored (ie, both the program counter and the status registers). When loading R15, however, the default action is only to update the program counter section – the value of the status registers remains the same. This allows the use of flags to indicate whether a subroutine worked: The error handler is a good example of this – if a SWI call returns with the V flag set, this indicates that an error has occurred. Should you wish to update all 32 bits of R15, suffix the command with a ^. So, in practice:

```
LDMFD R13!,{R0-R12,PC}^
```

would be used to return from a subroutine with all registers and flags preserved.



Calling subroutines

The Arm2 microprocessor, unlike many common processors, has no explicit method of calling and returning from subroutines. The preservation of the program counter and registers is the job of the programmer. Fortunately, due to the design of the Arm2, this is quite straightforward.

The BL instruction can be used to call a subroutine. The contents of R15 before the branch are stored into R14 (called the link register) which now contains the return address. Return to the calling routine by moving R14 into the program counter:

```
MOV PC,R14
```

This is the method used to return a machine code routine to Basic.

Sometimes it is necessary to call other subroutines, and in this case you need to store the return address onto the stack. As seen above, this is simply a case of:

```
STMFD R13!,{R14}
```

and return by pulling the value off the stack:

```
LDMFD R13!,{PC}
```

Obviously, any registers to be left can be included in the register list. SWI calls run in Supervisor mode, and hence they use the R14-SVC register to store the return address in. If you are writing code which runs in Supervisor mode, store the return address before issuing a SWI call, otherwise the return address will be lost.

Other considerations

The Arm2 microprocessor itself has no stack. The stacks normally used are those set up by the operating system for your use. Even so, there are occasions when it will be necessary to create your own stack. The most common situation is if you write absolute code, which always runs at &8000. There is no stack provided, so the simplest thing to do is to claim workspace from the RMA, using the OS_Module SWI call.

The address of the memory block provided can then be moved into R13, but you will have to use an empty ascending stack (EA), as the address given in R13 will be at the bottom of the memory block, rather than at the top.

Listing 1 provides an example of uses of stacks. The program lists, recursively, all the directories (and, optionally, files) on a disc, starting from any point. The use of recursion to traverse the directory structure is a classic use of the stack. The syntax of this utility is:

```
*DirAll (<-f>) <dir name>
```

By setting the -f option, the utility performs a CatAll.

A3000 ARCHIMEDES BBC B/MASTER ELECTRON

THE 4TH

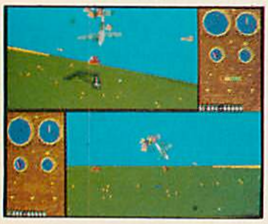
Chocks Away



Chocks Away is flight simulation the way you've always wanted it. It has everything for the beginner and the expert:

- Beautiful solid 256 colour graphics and 'nerve shattering' digitised sound effects.
- You pilot a very easy to fly, yet highly manoeuvreable bi-plane - ideal for all ages and skill levels.
- Revolutionary 2 player option using split screen display. This allows 2 players to each fly their own planes simultaneously in practice or on missions.
- Full joystick, dual joysticks, mouse and keyboard control options.
- Amazing "Black Box Flight Recorder" included so that you can record your own flights and then save and replay them.
- Learn landing, loops, rolls and other stunts the easy way by watching the 90 minutes of totally absorbing pre-recorded training flights included with the game.
- Powerful 30mm cannon capable of very rapid fire and long range destruction.
- Easy to read instrument panel and simple controls so you can concentrate on developing your flying skills.
- Internal and external views of your plane can be selected at any time from front, rear, left and right.
- 3 very varied immense maps to explore - approximately 18000 km² in total (6000 km² per map).
- 20 fascinating and varied missions of increasing complexity are included to guarantee weeks or even months of enjoyment.
- Promotion system from Cadet status right through to Marshal of the RAF.
- Realistic take-off and landing from runways and aircraft carriers.
- Special 2 player dogfight feature where your only aim is to shoot down your human opponent.
- Superb range of targets and enemies including bombers, triplanes, powerful fighters, tanks, ships, control towers and anti-aircraft guns. Up to 7 aircraft can be in a single encounter.
- Beautiful scenery including bridges, churches, houses, rugby pitches, warehouses, lighthouses and trees.
- Permanent high-score table which is saved automatically to disc.

Price: A3000/Archimedes £24.95



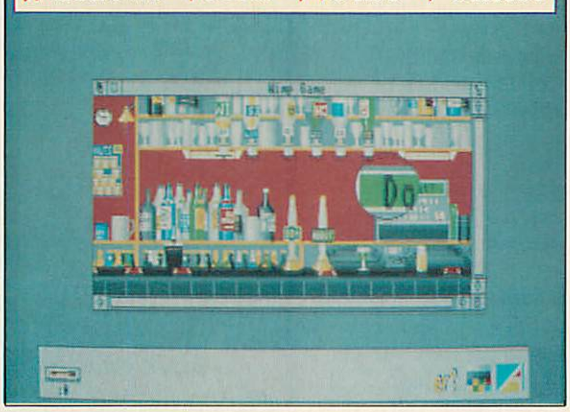






The Wimp Game

Windows - Icons - Mouse - Pointer



The Wimp Game is a brilliant pointer driven graphic adventure celebrating over 10 years of Acorn Home Computers. This revolutionary multi-tasking game is unlike any other game produced for the Archimedes and even allows you to run other programs whilst you play it.

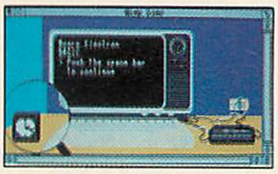
Work your way through the very different and very detailed locations using your pointer to try out the many objects and your magnifying glass to examine them.

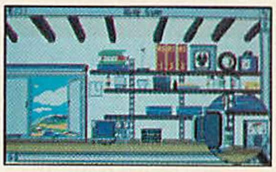
The Wimp Game has no time limit, no help, no hints, no score, no little green men, no space ships, no bombs and no guns. No keys on the keyboard are used. Your aim is to progress from being the owner of an Acorn Atom to being the owner of an Acorn R200 workstation - who said they'd already got one?

You can click on some objects and drag others about - click on the light switch in the first room and you'll see how it works. The 'adjust' button on the mouse will activate the magnifier to let you examine the scene in more detail. Be careful where you click - anything which hurts in real life will probably also do so in the game.

Price: A3000/Archimedes £19.95











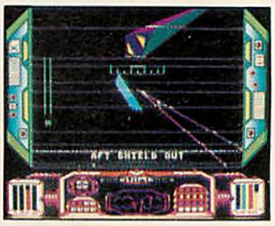


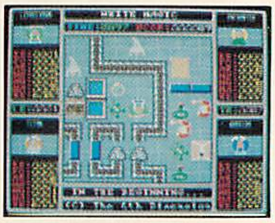


This 4 game collection really is The Real McCoy. These are genuine top games in their original format with full instructions. The games have been carefully selected for variety and include a thinking game, a sports game, a role playing adventure and an arcade game. Bought individually they would cost £81.80p making this a very prestigious special edition collection.

U.I.M. (RRP £29.95)
U.I.M. (Ultra Intelligent Machine) is a futuristic action adventure set in the oceans. It is a huge game featuring solid 3 dimensional graphics and digitised sound effects. You must travel the oceans in your highly expandible submarine visiting the numerous ports throughout the ocean networks. As well as gaining combat skills you'll need to learn to trade in commodities, shares and currencies. There are over 250 missions to complete before you will find your goal - the U.I.M. - created to be almost a god.

Price: A3000/Arc





A3000/Archimedes Games and Prices

Chocks Away	24.95	UIM (3D Action Adventure)	29.95
The Wimp Game	19.95	E-Type (3D Car Racing)	19.95
The Real McCoy	29.95	E-Type Designer	16.95
Dropship	19.95	E-Type Extra 100 Miles	16.95
Break 147	24.95	White Magic (Arcade Adventure)	19.95
Nevryon (Pure Arcade Action)	19.95	White Magic 2 + Designer	19.95
Pysanki (Arcade Adventure)	19.95	Arcade Soccer	19.95
Inertia (Isometric Action)	19.95	Holed Out (3D Golf)	19.95
Apocalypse (3D Mega Game)	29.95	Holed Out Extra Courses 1	16.65
The Olympics (6 Events)	19.95	Holed Out Extra Courses 2	16.95
Man-At-Arms (Arcade Adventure)	19.95	Holed Out Designer	19.95

All the above Archimedes games will work on the Archimedes A3000, 310 and 400 series

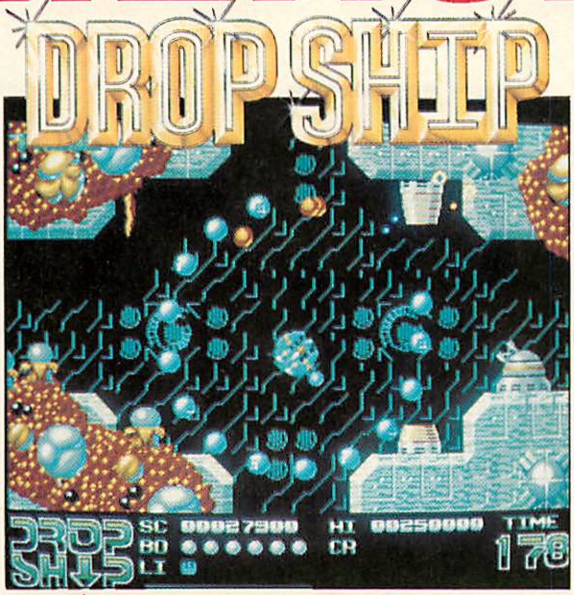
BBC & Electron Games	BBC B and Master 5¼" Disc	BBC and Electron Cassette	Master Compact 3½" Disc
UIM (3D Action Adventure)	19.95	-	21.95
E-Type (3D Car Racing)	14.95	9.95	15.95
Inertia (Isometric Action)	12.95	9.95	13.95
Nevryon (Arcade Action)	14.95	-	15.95
White Magic (Arcade Adventure)	12.95	9.95	13.95
White Magic 2 + Designer	12.95	9.95	13.95
Arcade Soccer	12.95	9.95	13.95
Holed Out (3D Golf)	14.95	12.95	15.95
Holed Out Extra Courses 1	11.95	9.95	12.95
Holed Out Extra Courses 2	11.95	9.95	12.95

All the above BBC games are compatible with BBC B, B+ & Master Series Computers

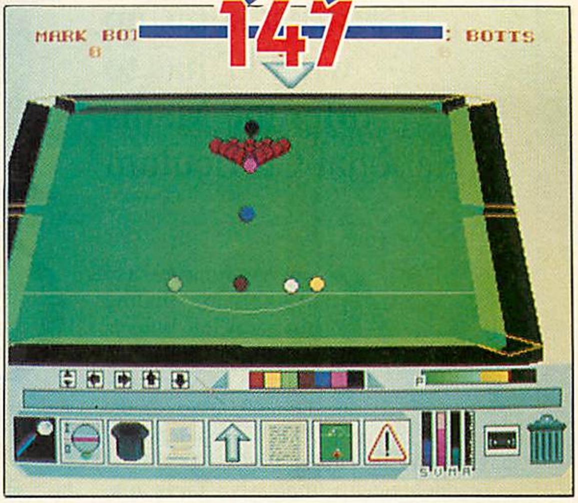
DIMENSION

A3000 ARCHIMEDES BBC B/MASTER ELECTRON





BREAK 147



ARCADE SOCCER (RRP £19.95)
Arcade Soccer really is WORLD CUP FOOTBALL ACTION at its very best. Using an overhead view to make gameplay as exciting as possible it features everything that you could want in a football game.

WHITE MAGIC (RRP £19.95)
White Magic is a unique arcade adventure in which you control 4 varied adventurers:- A Leprechaun, Titan, Warrior and Enchanter.
You can transform between all 4 characters at will and use their much needed special abilities. White Magic is not a game for the faint-hearted; it is a fast-action game which requires fierce hand-to-hand combat and frantic weapon fire.

QUAZER (RRP £11.95)
Quazer is a fast action arcade style game with excellent music, sound effects and graphics. It has 11 incredibly detailed and varied vertically scrolling levels filled with the most amazing assortment of baddies you are ever likely to see.

Drop Ship is one of the smoothest and fastest arcade games you are likely to see. It features superb 256 colour graphics, 15 increasingly large and diverse stages and an excellent stereo soundtrack.
The year is 2020....
The government proudly announces that the new fast breeder farm on the Mars colony is completely computer managed and totally safe, defended from attack at all times by a fully-automated tactical defence system.
The year is 2030....
Earth receives a transmission from the Mars colony. The radiation seems to have affected the management software at the fast breeder farm. The defence systems have gone haywire and the whole farm is rapidly approaching meltdown. If all the reactors are not shut down the Mars colony will be wiped out....
Shut down can only be achieved by removing and collecting the power crystals from each reactor. An almost impossible task made even harder by the fact that the defence systems are blowing away anything that moves. The defences include gun emplacements, artificial gravity generators, sporers and hoards of deadly aliens.
What is needed is a craft which is supremely manoeuvrable, capable of great speed and possessing awesome firepower, and a pilot of extraordinary bravery to fly it.
The craft is the Drop Ship.....
The pilot is You.....

MORE GAME INFO
Frame rate: 50 frames per second
Maximum objects on screen: 150 per frame
The game features completely custom-written screen handling routines
No use whatsoever is made of the operating system routines
The ship movement in the game is accurate down to 0.0001 of a pixel

By any measure snooker is one the most popular sports in the world today. Break 147 has been precisely designed exclusively for the A3000 and Archimedes computers to be as close as is possible to the real game itself.

Break 147 is a full 3D snooker simulation with superb solid graphics and brilliant digitised sound effects, speech and music. The game is controlled exclusively with the mouse.

It features incredibly realistic interaction between the balls and precise control of the cue ball - topspin, backspin, stun, screw, drag, swerve and masse shots. You can view the table from ANY angle or distance even as the balls are moving.

All the rules are fully implemented and you can play matches (against friends or computer players), trick shots or just practice. You will not only be able to replay your last shot but you can also replay whole frames and move in and around the table as you watch it. Highest breaks are saved automatically to disc.

You can even create and edit your own tables so you can design your own trick shots or set up your preferred practice positions. A manual is supplied with each game which gives the fascinating history of snooker and all the rules and instructions required to play BREAK 147.

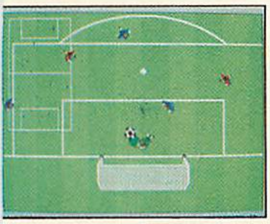
You will find that the game plays as if you were on a real snooker table with all the attendant features to take care of, but with a lot of the tedious parts - such as resetting the table, respotting the balls and scoring - maintained by your computer.
Win a Superb Engraved Trophy
This unique competition allows everyone who obtains a break of 100 or more to win a superb engraved snooker figurine on a solid marble base.

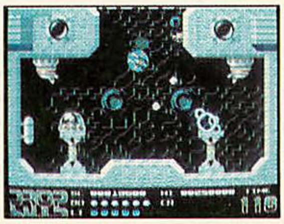
There's also a superb 16" trophy (to be engraved with the winners name) which will be awarded to the first entrant to achieve the maximum break of 147. Full details and entry coupon are included with the game.

medes £29.95

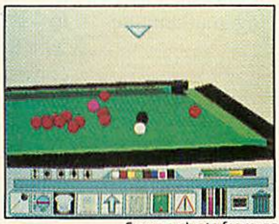
Price: A3000/Archimedes £19.95

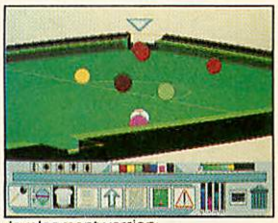
Price: A3000/Archimedes £24.95
Anticipated Release Date: Mid November '90



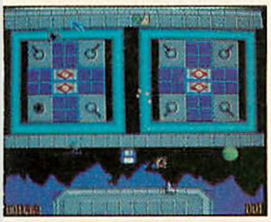


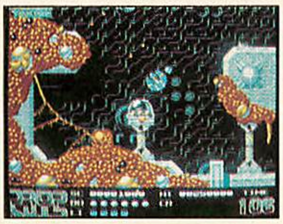


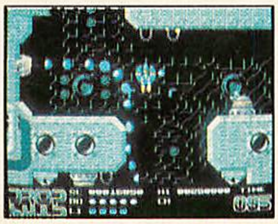




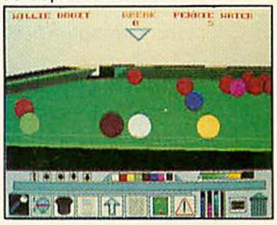
Screen shots from early development version











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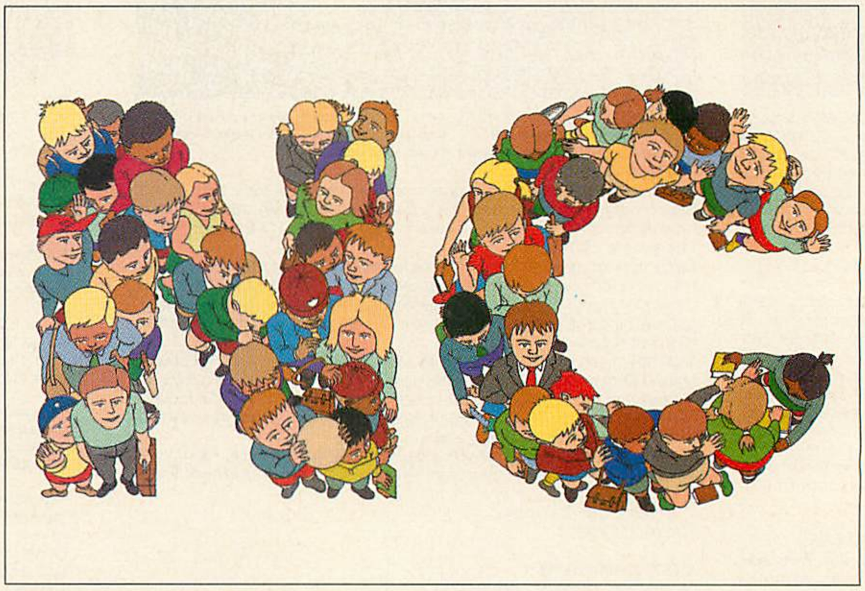
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The Fourth Dimension, Dept 4444, 1 Percy Street, Sheffield, S3 8AU

The Fourth Dimension

CHRIS DRAGE sums up what IT has to offer the Maths National Curriculum

HEAD COUNT



Many Archimedes and A3000s are finding their way into schools at all levels and much interest is currently being focussed on the role these powerful 32-bit computers will play in education in the 1990s.

Technologically impressive these machines might be, but is the software available to help deliver the National Curriculum effectively? Does the price for this sophisticated hardware mean that proven BBC packages which schools have accumulated over the years are rendered next to useless?

Compared with its eight-bit cousins, the Archimedes still lacks the volume of software across the curriculum that we have come to take for granted. Native Arc programs are now being developed but I suspect many schools would still like to make use of their existing software base. This is possible by adding a 5.25in disc drive (with its own power supply), an A3K6 (disc buffer) and A3K12 (DFS Rom) to an A3000. It is surprising how many existing BBC titles will run, albeit with varying degrees of success.

What follows is a resume of Archimedes and eight-bit software (running under A3K6-12) relevant to the Mathematics National Curriculum. The order for maths emphasises six areas of attainment:
*AT1/9 Using and applying mathematics
*AT2/3/4 Numbers
*AT5/6/7 Algebra
*AT8 Measures
*AT10/11 Shapes and space
*AT12/13/14 Handling data

There is, as such, no IT component although there are several mentions of activities like Logo which are, by their very nature, computer-based.

Numbers and algebra

Sherston's *Animated Numbers* is perhaps the most delightful program yet for introducing reception children to numbers. Addressing ATs 2, 3 and 4 (level 1), the program provides activities highlighting both the cardinal and ordinal value of numbers to 10, couched in the most delightful animated graphics.

Another popular Arc package for the very young is HS Software's *Maths Pack 1* which covers ATs 2 (level 1), 5 (level 1) and 6 (level 2). It comprises matching, counting (backwards/forwards) and sequencing activities and can keep records for up to 36 pupils. Children really enjoy the animated graphics and sounds. A great tool for stimulating thought and discussion about numbers for children at key stages 2 to 4 is *Numerator* from Longman Logotron which has been likened to a 'mathematical construction kit' or 'number cruncher'. It offers an extremely exciting means of tackling investigations into number processes and directly addresses ATs 1, 2, 3 and 6. It is highly graphical so children can see what is going on mathematically and utilise its building-block approach. *Numerator* is a great tool for stimulating thought and discussion about numbers and the Archimedes' version is outstanding.

The application of number concepts is a common theme throughout the Mathematics National Curriculum and the computer can play a major role in providing opportunities for problem-solving. Inspiring and motivating BBC software which runs on an upgraded A3000 includes *Slimwam2* (Association of Teachers of Mathematics), *Microsmile 1* and *The Next Seventeen* (both from Smile Centre) which are suites of programs dealing with a wide range of investigations and problem-solving.

Slimwam2 (Some Lessons in Mathematics with a Microcomputer 2) offers six investigations with substantial lesson notes and suggestions. Some of the programs will run correctly on an A3000 provided the menu system is circumvented. Comprising a combined suite of 47 programs, *Microsmile 1* and *The Next Seventeen* are designed for 11 to 16-year-olds dealing with a wide range of mathematical investigations. They present problems which many children would otherwise be unwilling to handle if presented traditionally.

Cars: Maths in Motion (Cambridgeshire Software House) is a simulation program which sets high standards. All manner of mathematical concepts come into play: angles, ratios, percentages, probability, arithmetic. Children find this program particularly motivating and rewarding.

Anita Straker has become one of education's most respected authors. Her *Mathematics Games Volumes 1* and *2* and *Mathematical Investigations in the Classroom* (Capital Media) are both of the same high standard.

By the same author and marketed by ESM is a new series entitled *Numbers in the National Curriculum*. Three of these run well on the A3000 (under the A3K6/12): *Getting Ready For Maths, Place Value*

Activities and *Number Games*. The first program introduces basic maths ideas like matching, sequencing, numeral recognition and patterns (AT5, level 2). *Place Value Activities* presents exercises on two and three-digit number ordering and operations (AT2, level 4). The final program deals with investigations and problem-solving relevant to AT3, level 3. The simplicity of design in these programs enables children to quickly get to grips with the content.

Droom from Resource has enjoyed enormous popularity for two years. The Archimedes version has stunning graphics and is also fully mouse-controlled. Animation is smooth, fast and the whole package is very responsive.

Everything in the BBC version is present but in a more sophisticated form – not that this makes it more difficult. On the contrary, there are few programs that grip seven and 11-year-olds as *Droom* on the Arc does. Its sequel, *Dust*, has just been released for the Archimedes too.

Schools possessing the Beeb versions of many Sherston packages will find they all run successfully on the A3000/A3K6-12. *Wizards Return* (eight to 11-year-olds), *Animal Rescue* (six to eight-year-olds) and *Space Mission Mada* (nine to 13-year-olds) are particularly recommended. The latter resembles *Dust* and offers a wide range of well-presented, mathematical problems.

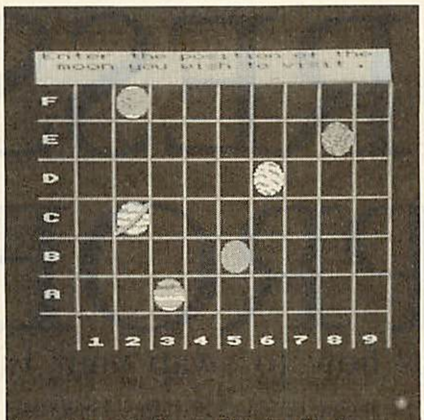
Giant Killer, aimed by Topologika at 10 to 14-year-olds, successfully marries the 'traditional' adventure style with mathematical problem-solving which recognises the role of calculators. *Giant Killer Support Disc*, a compendium of the puzzles found in *Giant Killer*, has also been published recently. Because they are graphically represented, the puzzles are easier for pupils to visualise, making this an essential purchase for *Giant Killer* users.

Shape and space

Logo provides perhaps the most creative mathematical environment you can get on a computer, particularly for addressing ATs 1, 10 and 11.

Tinylogo (Topologika) is a rewrite of the popular RM Nimbus program and makes good use of Risc OS facilities. Designed for infants, it is a Logo-like environment, similar to *Dart*, in which colour, sounds, sequencing, speed and repeats feature. *Dart* (The Advisory Unit) running under Risc OS also offers a very useful starting point for Logo with young children. The handbook is written for children, not teachers, and can be used to challenge them.

Archimedes Logo (Longman Logotron) has deliberately been made completely compatible with the earlier version. This means that programs and procedures saved with a BBC micro could be used with Archimedes Logo once they have been converted to Archimedes file format.



Learning with Space Mission Mada

It offers vastly increased speed (approximately 10 times faster than the BBC version) and possesses an enormous workspace. Some improvements to Archimedes Logo, notably a considerably enhanced debugging environment in which there are actually four separate ways of monitoring what is happening, make it more a descendant of the older Acornsoft Logo than Logotron's own version. Over 90 new primitives (commands) are available and as it uses Acorn's floating point emulator, it's quite accurate mathematically.

As far as turtle graphics are concerned, one aspect of Archimedes Logo which will undoubtedly excite many children is the ability to program multiple turtles. A multiple turtle module is included on the disc. Once installed it can control up to 32 turtles on screen simultaneously. Multiple turtles can be seen as important in exploring geometry and motion microworlds and on the Archimedes all 32 appear to move extremely quickly: stunning effects can be achieved in seconds. Output can be sent to a Linear Graphics Plotmate Plotter or a dot matrix printer using the Archimedes' built-in printer routines.

With the Archimedes, Logo now offers a realistic programming environment for Logo users and significantly extends what children can do.

Several Risc OS programs are now available which encourage and challenge children to investigate patterns and other spatial relationships. Two excellent examples are *The Art Machine Pattern Book* (Topologika) and *Craft Shop 1* and *2* (4Mation Educational Resources).

Comprising five programs investigating weaving, pattern, bounce, tiling and tracks, the former package lies at the very boundaries of art, design and mathematics. The comprehensive and beautifully illustrated booklet that accompanies the pack provides action, activity and inspirational pages and is a jolly good read in itself.

Craftshop 1 and *2*, also at the intersection of maths and art, possess the ability to rotate, scale and reflect complex patterns made from simple shapes, do curve stitching in both 2D and 3D and tesselate patterns. An embroidery program allows 'embroidered' designs to be created using patterns formed by combining stitches. These packages are among the best Archimedes schools' software to date.

Data handling

Spreadsheets are major educational software tools destined to play an increasingly prominent role in data handling at key stages 2 to 4 and are perhaps the least understood of all software both in terms of function and the uses to which they can be put in the school context. These will be dealt with in a future article.

All this is really just a taster for better things to come. In 1991 Longman Logotron plans to release a total solution to the IT-related statements of attainment in maths for key stages 3 to 4 which will couple loosely with Logotron software.

Multimedia education too is just around the corner. Earlier this year the British Nuclear Forum launched three double-sided, interactive video discs, packaged with an A3000 and laserdisc player and substantial support materials relating directly to the National Curriculum, all for under £1900.

Two of the discs are science-based while the third is mathematical in content, investigating risk, probability and statistics. This resource really adds a whole new dimension to the role of the computer in the classroom by providing perhaps the ultimate in simulation. What will the truly interactive CD-Rom offer?

WRITE TO . . .

Sherston Software, Swan Barton, Sherston, Malmesbury, Wiltshire SN16 0LH.
HS Software, FREEPOST, Swansea SA2 9ZZ.
Longman Logotron, Dales Brewery, Gwydir Street, Cambridge CB1 2LJ.
Association of Teachers of Mathematics, 7 Shaftsbury Street, Derby DE3 8YB.
Smile Centre, Middle Row School, Kensal Road, London W10 5DB.
Cambridge Software House, 6 The Quay, St Ives, Huntingdon, Cambridgeshire PE17 4AR.
Capital Media, John Ruskin Street, London SE65 0PQ.
ESM, Duke Street, Wisbech, Cambridge, PE13 2AE.
Resource, Exeter Road, Off Coventry Grove, Doncaster DN2 4PY.
Topologika, Box 39, Stilton, Peterborough PE7 3BR.
Advisory Unit, Endymion Road, Hatfield, Hertfordshire AL10 8AU.
Linear Graphics, Unit 39, Mochdre Industial Estate, Newtown, Powys, Midwater, SY16 4LE.
4Mation Educational Resources, Linden Lea, Rock Park, Barnstaple EX32 9AQ.
British Nuclear Forum, 22 Buckingham Gate, London SW1E 6LB.

ADDRESSING THE PROBLEM

A B C D E F G H I J K L M N O P Q R

DAVE LAWRENCE shows how to swap your Filofax for an Archimedes

Have you ever sat at your desk programming away and suddenly needed an address or phone number? If you're well organised, you'll have one of those 'filothingies' and can look up the relevant information quickly. Personally, I never got the hang of those silly hole punches.

So until now I've resorted to my standard address book and telephone index, where you slide the little nodule along to the right letter, press the button and the lid flips up and bashes you on the nose.

I think this is where my problem lay – I had two sources of information, neither of which was entirely accurate. The solution? Easy – use my trusty Archie! A bit like using a Lambourghini to go to Sainsbury's, but flashy all the same.

I didn't want to use an existing database program as they are all too slow (load program, load address database, search for name). They are also difficult to access without stopping what you're doing. I tend not to use the desktop environment a lot, it's great for running applications as an end user, but being more of a programmer myself, I normally use Basic and the supervisor, so *Pipedream*, *Multistore* and similar applications were out. Hmmm, I thought to myself, I can spot a program here! Two days later I had written *AB*, the all-singing, all-dancing address book module, the source code for which can be found in this month's yellow pages. If you would like to use it, the usual rules apply – type it in and run it (or buy the monthly disc) and I'll tell you how it works.

Using AB

Once the module is loaded, *HELP AddressBook will show a list of the commands provided. You could work out what they all do by typing *HELP for each one, but I'll run through what they do here anyway.

To add a new entry to the phone book, type *AddName. This will prompt you for the name, address and phone number to add. The name is split into surname and forename, the address into three 'local' address fields – town or city, county and postcode. Provision is made for a home and work phone number. Finally there is the mystical QuickRef – more of this later! The entire entry is called a 'card'.

Pressing RETURN will advance the cursor to the start of the next field. You can use the cursor keys to move backwards and forwards through the card – DELETE deletes characters and COPY deletes to the right. Once you are satisfied with the card, press RETURN with the cursor on the QuickRef field. This will store the information in the address book. Pressing ESCAPE at any time will quit the entry process and nothing will be added to the book.

The QuickRef is a short cut that allows a particular card to be specified very easily and uniquely. All the other star commands that access the address book need a way of indexing the cards. The quickest way (as the name implies) is by using the QuickRef field. If, for example, you have just entered your mum's address, entering MUM in the QuickRef field will allow you to access her card simply by referring to it as 'MUM'. Try typing the following:

```
>*AddName
Surname : Jarvis
Forename : Angela Hazel
Addr 1 : Sunnyview
Addr 2 : 23 Railway Cuttings
Addr 3 :
Town : Grottytown
City : Bigplace
County : Nastyshire
Postcode : GT3 6CW
Home : (0422) 679004
Work :
QuickRef : MUM
>_
```

To find your mum's phone number, you can now type any of the following:

```
*PHONE MUM
*PHONE JaRViS
*PHONE A Jarvis
*PHONE Angela Jarvis
*PHONE A H Jarvis
*PHONE Angela H Jarvis
*PHONE Angela Hazel Jarvis
*PHONE aNG HaZ JARvis
```

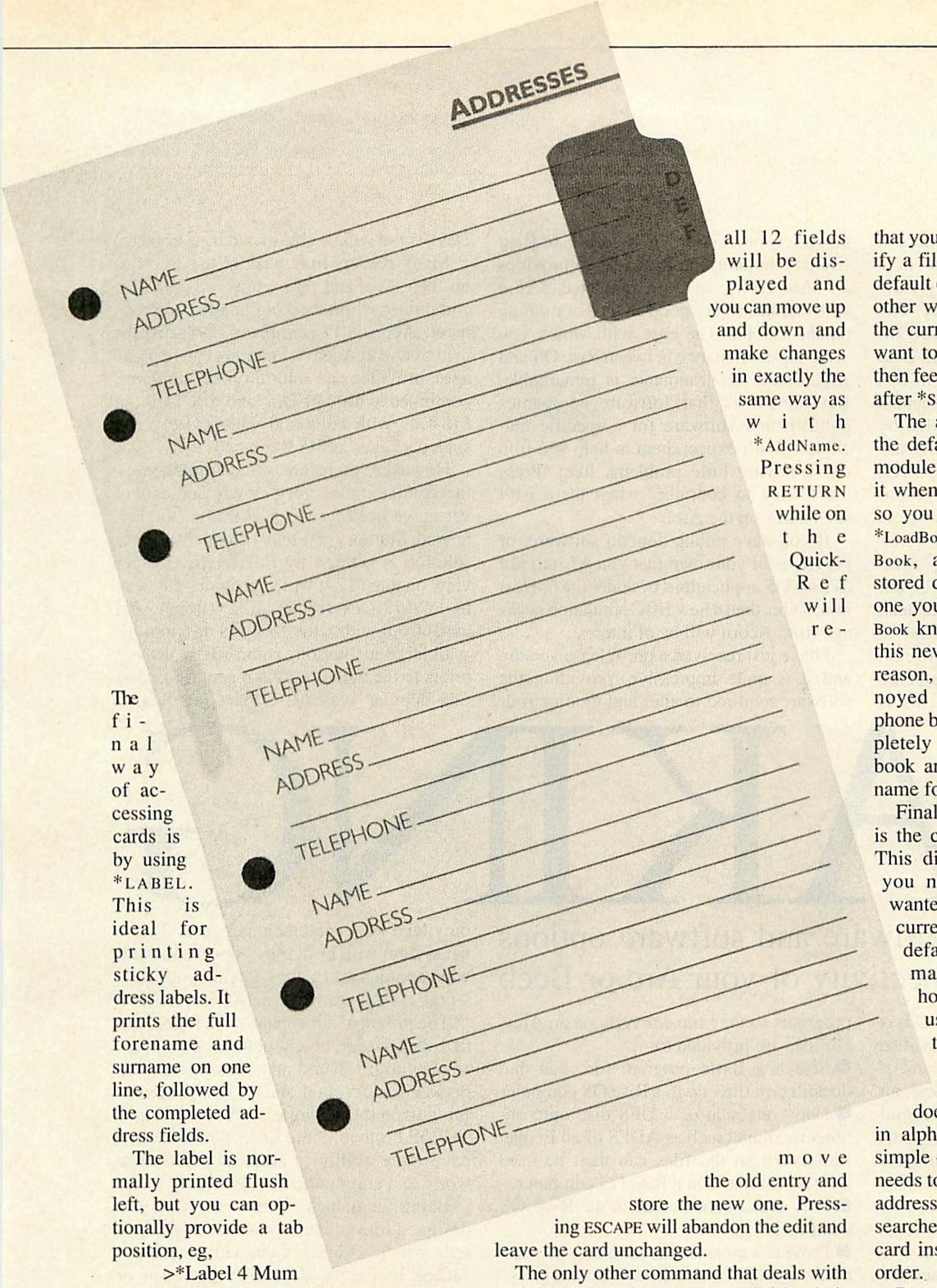
The first example illustrates the use of the QuickRef, the others show that you can also search given a surname, perhaps with an abbreviation of the forename. As you can see, the search is not case sensitive.

*ADDRESS provides a similar function to *PHONE, but obviously shows the address fields rather than the phone numbers.

Both these commands will only show fields if they contain information. Thus in the above example no work number will be shown (as there isn't one) and if you tried *ADDRESS 'Addr 3' nothing would be shown.

There are two other commands for examining address cards. The first is *ListAll. Used by itself this will list the surnames and forenames of all entries in the phone book. Due to the way the cards are stored, this will not necessarily be in any useful order (see below for more details). To make this command of some use, you can provide it with an abbreviation, it will then list all entries whose surname matches the abbreviation, eg,

```
>*ListAll J
Jarvis, Angela Hazel
Jordan, Gavin
Johnson, Oliver
Jangle, Gordon
Jorgensen, Hans
>*ListAll Jo
Jordan, Gavin
Johnson, Oliver
Jorgensen, Hans
>*ListAll Joh
Johnson, Oliver
>_
```



The final way of accessing cards is by using *LABEL. This is ideal for printing sticky address labels. It prints the full forename and surname on one line, followed by the completed address fields.

The label is normally printed flush left, but you can optionally provide a tab position, eg,

```
>*Label 4 Mum
    Angela HazelJarvis
    Sunnyview
    23 Railway Cuttings
    Grottytown
    Bigplace
    Nastyshire
    GT3 6CW
>_
```

There is no built-in way of automatically sending this to a printer, so to do this, type CTRL-B before pressing RETURN after the *LABEL command. Once the label has printed, type CTRL-A, DELETE, CTRL-C. This will remove the '>' from the printer's buffer and switch the printer off.

Of course, people move and change their phone numbers, so some method of updating the information is needed.

To alter an existing card use *EditName. As usual you'll either need to give a QuickRef or a surname. If the card can be found, all 12 fields will be displayed and you can move up and down and make changes in exactly the same way as with *AddName. Pressing RETURN while on the QuickRef will remove the old entry and store the new one. Pressing ESCAPE will abandon the edit and leave the card unchanged.

The only other command that deals with individual cards is *DeleteName. Fairly obviously this permanently removes a card from the phone book. Useful if you suddenly make an enemy!

You'll want to save all your hard work, so, there are no marks for guessing what *SaveBook does. What you may not guess is that you don't need to specify a filename as there is a default one, %.AddrBook – in other words, AddrBook in the current library. If you want to use another name then feel free to specify one after *SaveBook.

The advantage of using the default one is that the module will attempt to load it when it initialises itself, so you don't need to use *LoadBook yourself. *LoadBook, also changes the stored default name to the one you specify, so *SaveBook knows where to save this new file. If, for some reason, you get really annoyed with a particular phone book, *NewBook completely clears the current book and sets up the filename for a new one.

Finally, for trivia freaks, is the command *BookInfo. This displays four things you never realised you wanted to know about the current phone book – the default filename, how many entries it has, how much memory it uses and how much there is left.

If you want to know why *ListAll doesn't display the list in alphabetical order, it's simple – when a new card needs to be entered into the address book, the book is searched through and the card inserted in alphabetic order.

But the clever bit is IN ALPHABETIC ORDER OF THE QUICKREF, not the surname!

This means that the search routine used by *PHONE and the other commands is a lot quicker when using QuickRefs.

If you're interested in the format of the save files, it's easy to examine one by loading it into *Twin* or *!Edit*. Cards are separated by Ascii 10s and fields by Ascii 0s. You should then easily be able to see how the cards are sorted.

Next month there will be a short article showing how this program was written.



Friends' numbers can be found easily

MAKING CONNE

CHRIS DRAGE looks at hardware and software options that expand the connectivity of your Arc or Beeb

The ability to connect a variety of devices to a computer system greatly enhances its use. The 'compuspeak' term for computers talking to each other is 'connectivity'. This comes in two forms – computers physically connected by leads, with data transfer controlled by communications software; or software which tries to emulate another computer's operating system thereby allowing you to run an alternative range of software.

The problems of connecting Acorn machines to each other has been largely overcome by a number of companies. For example, Beebug has a serial transfer lead and software which allows the transfer of DFS *View/Wordwise* files into an Archimedes (A3000 fitted with the serial interface) and onto ADFS discs. This is fine for a once-only transfer of files, as it is cheaper than purchasing an external disc interface. For a more permanent means of getting BBC files from 5.25in discs, an external disc interface is essential. Several companies provide these, usually accompanied by software to transfer your DFS files onto ADFS 3.5in disc format. Try Beebug, CJE Micros and Pres.

Acorn produces three emulators:

- !65Host emulates the BBC model B
- !65Tube emulates the 65C02 second processor
- PC emulator emulates standard IBM PCs

To enjoy the ability to run existing BBC software on an Arc (important for schools which have invested large amounts of time and training) then the Pres A3K6/12 interface in combination with a 5.25in disc drive (with psu) is a must.

At present this system runs only on the A3000, but is rumoured to be under development for the A300/400 series. Using the most recent version of Acorn's 65Host (BBC) emulator, the Pres system provides an 'Arc DFS', so even protected 5.25in software has a very good chance of running on the A3000. The ease with which you can chop-and-change between Risc OS and BBC micro environments is remarkable. But remember that software companies publish their software for a specific machine – don't expect them to help you iron out annoying little problems like: 'Press the f0 key to continue' when there isn't such a key on the Arc!

If you have public domain software, or programs of your own that you wish to run as Risc OS applications or under the 65Host or 65Tube, then a new BBC emulation package from Acorn will be of interest.

I have just received a pre-release version and it is quite impressive, providing the software required to alter and modify your programs so they run correctly on an Arc. Utilities are provided to:

- Search a Basic program for code that doesn't port directly to a Risc OS computer
- Copy one side of a DFS disc onto another medium (such as ADFS or an Econet fileserver), so the files can then be used with an emulator on a Risc OS computer
- Port BBC screen files onto Risc OS computers
- Provide a means of porting files of user-defined graphics onto Risc OS computers

The new emulator can run programs written in BBC Basic (including its built-in assembler); machine code (including programs compiled from high-level languages); programs using hardware add-ons – if they have been written following Acorn's guidelines – and many applications on a Risc OS computer that were originally written for the 65C02 second processor.

This new (and last) BBC emulation will be distributed to education via IT advisers. Dealers too will be able to purchase licences.

Many readers may wish to use PC files on their Arcs and thus enjoy superior Risc computing while working in a PC environment. Acorn's PC emulator (£99, distributed free with Acorn's Learning Curve package), provides one solution. This emulator, combined with MS-Dos and DR-Dos (an MS-Dos with bells and whistles) can run such packages as *MS Word* and *Lotus1-2-3*.

However, there are some limitations – the emulator runs very slowly and cannot yet make use of 1Mb of Ram nor the Extended Memory System (EMS). A neater solution is offered by *PC Access* (see review on page 129) which provides gateway to PC/MS-Dos format discs (floppy and hard) from within the Risc OS desktop.

In large institutions connectivity usually refers to the network(s) in place. Acorn has two popular systems: Econet (an ECOnomy NETwork) and the much faster Ethernet system with bridging systems and gateway computers to join Local Area Networks (LANs) to wider network systems.

The principal advantages of networks are that they enable costly peripherals and resources to be shared and allow messaging between individual users and programs running on the network. With Acorn's new TCP/IP Protocol Suite Econet and Ethernet have more ability to connect to the open world and communicate than ever before.

Being an industry standard, TCP/IP is designed for optimum power and performance where 'clones' or emulations will not suffice. It directly addresses the problem of 'open' networks by linking machines from different manufacturers and is widely found in Unix systems, for example.

The Cambridge Computer Z88 is a portable computer with direct links available to the BBC B, Master 128, Archimedes, A3000, IBM PC, RM Nimbus and Apple Macintosh. It plays a vital and cost-effective role in providing common ground for Acorn's computers.

The Z88 is built round *Pipedream*, a

comprehensive wordprocessor and spreadsheet. Voted by *BAU* as the best 32-bit business software of 1989, *Pipedream* can be found in one form or another on the IBM PC, Archimedes/A3000 and BBC micro (*View Professional*). If you work with numbers, text or lists on an Arc or Master at home, the *Pipedream* environment offers a convenient way of transferring files to the office computer.

Similarly, the Z88 has BBC Basic, which provides a common software environment on several computers. For example, a program written on an RM Nimbus under BBC Basic(86) will transfer happily to a Z88 and thence to a Master 128 where it will run without modification.

The applications of a Z88 in the school environment are wider than is first apparent, eg, it can be a data recording device to be taken on field work where numbers can be recorded on a suitable spreadsheet table.

On return to the classroom the files containing data may be transferred on to the class Archimedes for final editing and presentation, with the help of DTP and graphing packages.

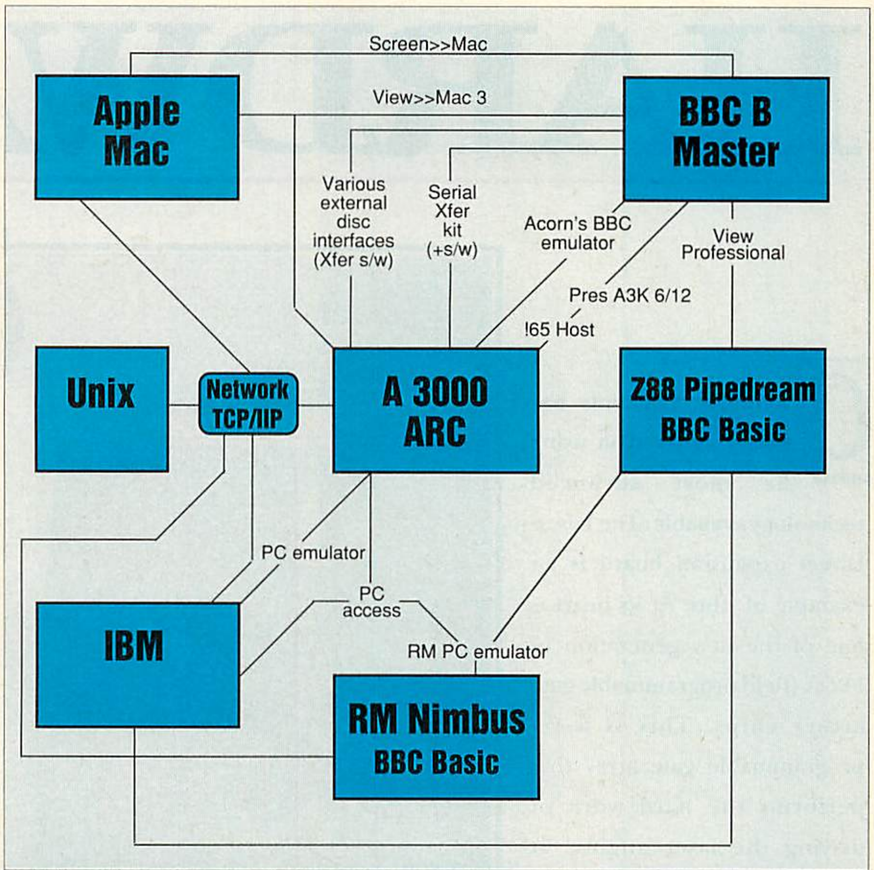
Similarly, it may become part of a *Genesis* application. A suitcase of Z88s in the school takes wordprocessing to the pupil yet preserves access to the more powerful classroom computer which is used for improving final presentation, spellchecking, printing and saving files to floppy disc.

If you use *Pipedream* on your Arc then the necessary lead (£13) and Z88 communications Eprom (£15) is available from Colton Software. Files can be transferred without *Pipedream* being present, but for this you will need the standalone Z88 link from Lindis International. The BBC Link is also available from Lindis.

BBC Basic is perhaps the most widely known programming language in the UK and has become a common programming environment for other computers other than Acorn's. Arguably the most popular of these are BBC Basic(86) for the RM Nimbus and BBC Basic on the Apple Macintosh.

The RM version has greatly increased the range of educational software running on that machine, as BBC Basic(86) provides software publishers with a simple means of porting their software across.

Mac BBC Basic offers even more compatibility – file transfer between it and an Arc or Beeb is easy. I have yet to try writing a BBC Basic program on the Nimbus and running it on a Mac! Has anyone tried?



Relationships between systems are not as complex as you might think

Although the Beeb has its art programs, none are as easy to use as those on the Macintosh (eg, *MacPaint*). *Screen>>Mac* makes transferring screen images from a Beeb to a Mac and back again very simple.

View>>Mac3 provides the perfect solution for transferring files between an Archimedes/BBC/Master and Macintosh. It supports all the major document formats on the Beeb and Archimedes (*View*, *View Professional*, *Wordwise*, *Interword*, *Edword*, *First Word Plus* and *Pipedream*). The beauty of the *View>>Mac3* system is that it is very easy to transfer files in either direction, quickly and efficiently.

Product details and suppliers

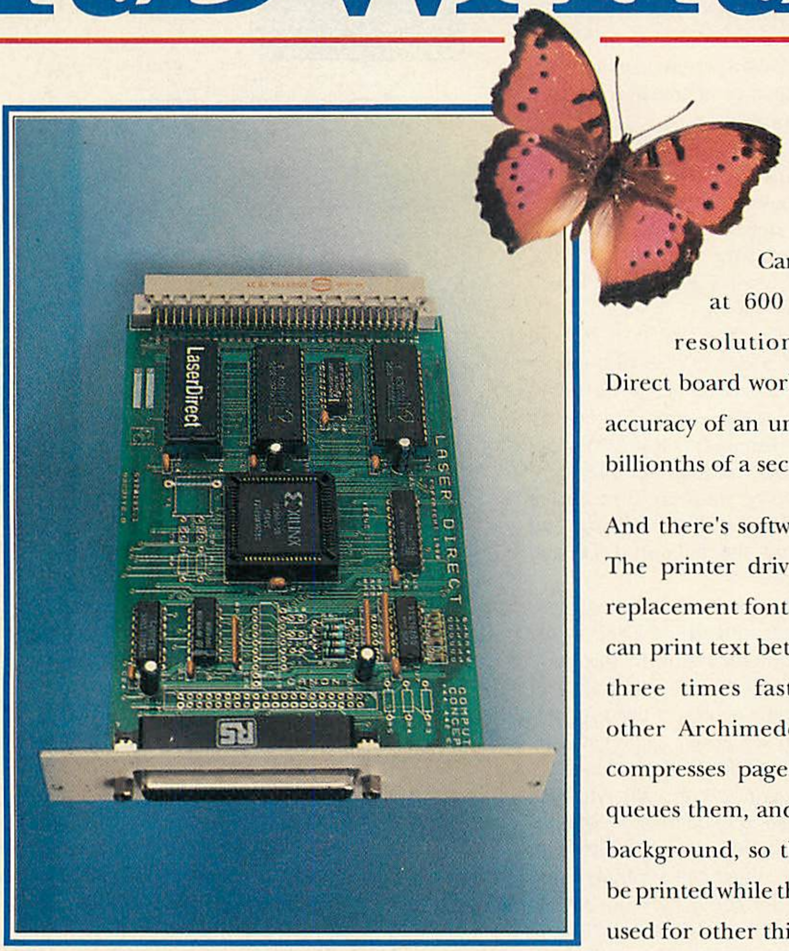
- *View>>Mac3* is an excellent transfer utility which any Arc/BBC B user with access to a Mac cannot do without!

BBC Basic, *Screen>>Mac View>>Mac3* (£79) and cables (£28.75) are available from: Human Computer Interface Ltd, 25 City Road, Cambridge, CB1 1DP.

- For information about the BBC emulator and TCP/IP protocols suite, contact: Acorn Computers Ltd, Fulbourne Road, Cherry Hinton, Cambridge CB1 4JN
- The Z88 (£287): available from Lindis International Ltd, PO Box 10, Halesworth, Suffolk IP19 0DX,
- *Pipedream* (£147) and *View Professional* (£69): available from Colton Software, Broadway House, 149-151 St Noets Road, Hardwick, Cambridge CB37QJ.
- Serial link kit is available from Beebug Ltd, 117 Hatfield Rd, St Albans, Herts AL1 4JS (for the BBC B, B+, Master 128).
- *PCAccess* (£39.95) is available from Minerva Software, Baring Crescent, Exeter, Devon EX1 1TL.
- For information on BBC Basic(86), contact Research Machines Ltd, Mill Street, Oxford.

CTIONS

SOFT HARDWARE



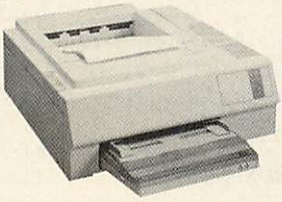
Computer Concepts has always believed in using the most advanced technology available. The Laser-Direct expansion board is an example of this. At its heart is one of the new generation of FPGA (field programmable gate array) chips. This is a re-programmable gate array that performs the hard work of driving the laser engine. It handles all the complex timing, buffering and serialising of the data sent to the laser.

The real beauty of the software design comes from the re-programmable nature of the chip. Using the same board design we re-arrange the circuitry to drive either our 300 dpi liquid crystal printer, or a Cannon 300 dpi laser printer, even though the physical interfaces of the two printers are completely different. We use exactly the same technique to change the circuitry, in the blink of an eye, to drive the Cannon printers at 600 dpi. At this resolution the Laser-Direct board works to a timing accuracy of an unbelievable 50 billionths of a second.

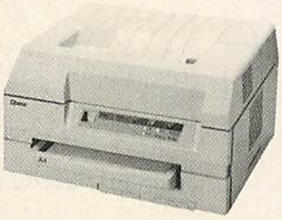
And there's software to match. The printer drivers include a replacement font manager that can print text between two and three times faster than any other Archimedes printer. It compresses pages in memory, queues them, and prints in the background, so that pages can be printed while the computer is used for other things.

Laser Direct

The bottom line is that we can bring the highest performance laser printers to the Archimedes for the lowest possible cost- 300 dpi, 6 pages per minute for £999 + VAT. 600 dpi, 8 page per minute for £1495 + VAT. 'The lowest cost 600 dpi printer in the world'.



600 dpi 8 page per minute Laser-Direct Hi-Res



300 dpi, 6 page per minute Laser-Direct.

Computer Concepts Ltd

Leading Edge Hardware & Software Technology

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COMPATIBILITY

Program	Page	BBC B	B+/128	Master 128	Master Compact	Electron	Arc	6502SP/ Turbo	ADFS	Econet	Shadow Ram	Monthly Disc
Risc Revue	30						■		■	■		■
Eight Bits	57											
Listing 1-2				■	■				■	■	■	■
Listing 3		■	■	■	■	■		■	■	■	■	■
Wireworld	64						■		■	■	■	■
Picpac (1)	66	■	■	■	■	■		■	■	■	■	■
Mozart Dice (2)	69											■
Address Book	84						■		■	■	■	■
Arm programming	77						■		■	■	■	■

Note (1) ADFS Users only, requires last months listings
(2) Ample listing

RISC REVUE

Listing 1

```
10 REM >BoxSolid (RR1)
20 REM by James Gallagher
30 REM for Archimedes only
40 REM (c) BAU December 1990
50 :
60 MODE 141
70 OFF
80 ORIGIN 640,512
90 ON ERROR PROCerror:END
100 PROCmisc_variables
110 light_from()=.5,0,1
120 light_to()=0,0,0
130 view_from()=130,60,80
140 view_to()=0,0,0
150 PROCorientate_scene
160 DIM box1(2,7),box2(2,7)
170 DIM img_data%(18000)
180 data%=0
190 FOR param%=435 TO -435 STEP-5
200 theta%=ABS param%
210 IF screen%=1 PRINT "Creating image
animation data..."
220 CASE theta% DIV 90 OF
230 WHEN 0
240 PROCcreate_box(box1(),0,0,0,10,10,
10,theta%*2,0,0)
250 WHEN 1
260 IF theta%<135 THEN
270 PROCcreate_box(box1(),0,(80-theta%
)/2,0,10,5,10,0,0,0)
280 PROCcreate_box(box2(),0,(theta%-80
)/2,0,10,5,10,0,0,0)
290 ELSE
300 PROCcreate_box(box1(),0,27.5,0,10,
5,10,0,0,2*(theta%-130))
310 PROCcreate_box(box2(),0,-27.5,0,10
,5,10,0,0,2*(130-theta%))
320 ENDIF
330 WHEN 2
340 PROCcreate_box(box1(),0,27.5,(156-
theta%)/4,10,5,5,0,0,90)
350 PROCcreate_box(box2(),0,-27.5,(156
-theta%)/4,10,5,5,0,0,90)
360 PROCdisplay_box(box1(),red)
370 PROCdisplay_box(box2(),red)
380 PROCcreate_box(box1(),0,-27.5,(the
ta%-156)/4,10,5,5,0,0,90)
390 PROCcreate_box(box2(),0,27.5,(thet
a%-156)/4,10,5,5,0,0,90)
400 WHEN 3
410 PROCcreate_box(box1(),0,27.5,-28.5
,10,5,5,0,0,-theta%)
420 PROCcreate_box(box2(),0,-27.5,-28.
5,10,5,5,0,0,theta%)
430 PROCdisplay_box(box1(),red)
440 PROCdisplay_box(box2(),red)
450 PROCcreate_box(box1(),0,-27.5,28.5
,10,5,5,0,0,-theta%)
460 PROCcreate_box(box2(),0,27.5,28.5,
10,5,5,0,0,theta%)
470 WHEN 4
480 PROCcreate_box(box1(),(theta%-350)
/2,27.5,-28.5,5,5,5,0,0,0)
490 PROCcreate_box(box2(),(350-theta%)
/2,27.5,-28.5,5,5,5,0,0,0)
500 PROCdisplay_box(box2(),red)
510 PROCdisplay_box(box1(),red)
520 PROCcreate_box(box1(),(theta%-350)
/2,-27.5,-28.5,5,5,5,0,0,0)
530 PROCcreate_box(box2(),(350-theta%)
/2,-27.5,-28.5,5,5,5,0,0,0)
540 PROCdisplay_box(box2(),red)
550 PROCdisplay_box(box1(),red)
560 PROCcreate_box(box1(),(theta%-350)
/2,-27.5,28.5,5,5,5,0,0,0)
570 PROCcreate_box(box2(),(350-theta%)
/2,-27.5,28.5,5,5,5,0,0,0)
580 PROCdisplay_box(box2(),red)
590 PROCdisplay_box(box1(),red)
600 PROCcreate_box(box2(),(theta%-350)
/2,27.5,28.5,5,5,5,0,0,0)
610 PROCcreate_box(box1(),(350-theta%)
/2,27.5,28.5,5,5,5,0,0,0)
620 ENDCASE
630 PROCdisplay_box(box1(),red)
640 IF theta%>=90 PROCdisplay_box(box2
(),red)
650 img_data%(data%)=-1
660 data%+=1
670 PROCswap_screen
680 NEXT
690 PROCanimate
700 END
710 :
720 DEF PROCanimate
730 data_end%=data%
740 REPEAT
750 data%=0
760 WHILE data%<data_end%
770 IF NOT img_data%(data%) THEN
780 GCOL img_data%(data%) AND 63 TINT
img_data%(data%)
790 MOVE img_data%(data%+1),img_data%(
data%+2)
800 MOVE img_data%(data%+3),img_data%(
data%+4)
810 PLOT &55,img_data%(data%+5),img_da
ta%(data%+6)
820 PLOT &55,img_data%(data%+7),img_da
ta%(data%+8)
830 data%+=9
840 ELSE
850 data%+=1
860 PROCswap_screen
870 ENDIF
880 ENDWHILE
890 UNTIL FALSE
900 ENDPROC
910 :
920 DEF PROCdisplay_box(box(),col%)
930 FOR vertex%=0 TO 7
940 PROCimage(box(0,vertex%),box(1,ver
tex%),box(2,vertex%))
950 box_image(0,vertex%)=img(0)
960 box_image(1,vertex%)=img(1)
970 NEXT
980 RESTORE 1330
990 FOR face%=1 TO 6
1000 READ a%,b%,c%,d%
1010 vec3()=(box_image(0,b%)-box_image(
0,a%)),(box_image(1,b%)-box_image(1,a%))
1020 vec4()=(box_image(0,c%)-box_image(
0,b%)),(box_image(1,c%)-box_image(1,b%))
1030 IF vec3(0)*vec4(1)-vec3(1)*vec4(0)
<0 THEN
1040 vec1()=(box(0,b%)-box(0,a%)),(box(
1,b%)-box(1,a%)),(box(2,b%)-box(2,a%))
1050 vec2()=(box(0,c%)-box(0,b%)),(box(
1,c%)-box(1,b%)),(box(2,c%)-box(2,b%))
1060 vec1()=vec1()/MODvec1():vec2()=vec
2()/MODvec2()
1070 n()=(vec1(1)*vec2(2)-vec1(2)*vec2(
1)),vec1(2)*vec2(0)-vec1(0)*vec2(2),vec1
(0)*vec2(1)-vec1(1)*vec2(0)
1080 n()=n()*light_vec()
1090 light_strength=SUM n()
1100 shade%=dark%+(11-dark%)*light_stre
ngth
1110 IF shade%<dark% shade%=dark%
1120 t%=(shade% AND 3)<<6:s%=21+21*(sha
de%>>2)
1130 GCOL s% AND col% TINT t%
1140 MOVE box_image(0,b%),box_image(1,b
%)
1150 MOVE box_image(0,a%),box_image(1,a
%)
1160 PLOT &55,box_image(0,c%),box_image
(1,c%)
1170 PLOT &55,box_image(0,d%),box_image
(1,d%)
1180 img_data%(data%)=(s% AND col%) OR
t%
1190 img_data%(data%+1)=box_image(0,b%)
1200 img_data%(data%+2)=box_image(1,b%)
1210 img_data%(data%+3)=box_image(0,a%)
1220 img_data%(data%+4)=box_image(1,a%)
1230 img_data%(data%+5)=box_image(0,c%)
1240 img_data%(data%+6)=box_image(1,c%)
1250 img_data%(data%+7)=box_image(0,d%)
1260 img_data%(data%+8)=box_image(1,d%)
1270 data%+=9
1280 ENDIF
1290 NEXT
1300 ENDPROC
1310 :
1320 REM Order of vertices for each fac
e:
1330 DATA 0,1,2,3,4,5,6,7,0,4,7,1,1,7,6
,2,2,6,5,3,3,5,4,0
1340 :
1350 DEF PROCimage(xo,yo,zo)
1360 obj_pos()=xo,yo,zo
1370 rel_obj_pos()=obj_pos()-view_from(
)
1380 rel_obj_pos()=rotate().rel_obj_pos
()
1390 scale=-image_dist%/rel_obj_pos(0)
1400 img()=(scale*rel_obj_pos(1)),(scal
e*rel_obj_pos(2))
1410 obj_behind_viewer%=rel_obj_pos(0)>
=0
1420 ENDPROC
1430 :
1440 DEF PROCorientate_scene
1450 view_vec()=view_to()-view_from()
1460 light_vec()=light_to()-light_from(
)
1470 light_vec()=light_vec()/MODlight_v
ec()
1480 IF ABS view_vec(0)<small view_vec(
0)=small*SGN view_vec(0)
1490 IF view_vec(0)=0 view_vec(0)=small
1500 yrot=-ATN(view_vec(2)/view_vec(0))
1510 zrot=-ATN(view_vec(1)/SQR(view_vec
(0)*view_vec(0)+view_vec(2)*view_vec(2))
)
1520 IF SGNview_vec(0)=1 zrot=PI-zrot
1530 xrot=ATN(TANyrot*SINzrot)
1540 cx=COS xrot:cy=COS yrot:cz=COS zro
t
1550 sx=SIN xrot:sy=SIN yrot:sz=SIN zro
t
1560 rotate()=(cy*cz),sz,-sy*cz,-(cx*cy
*sz+sx*sy),cx*cz,cx*sy*sz-sx*cy,cx*sy-sx
*cy*sz,sx*cz,sx*sy*sz+cx*cy
1570 ENDPROC
1580 :
1590 DEF PROCcreate_box(RETURN box(),x,
y,z,l,w,h,xrot,yrot,zrot)
1600 xrot=RAD xrot:yrot=RAD yrot:zrot=R
AD zrot
1610 cx=COS xrot:cy=COS yrot:cz=COS zro
t
1620 sx=SIN xrot:sy=SIN yrot:sz=SIN zro
t
1630 box_rot()=(cy*cz),-(sx*sy*cz+cx*sz
),sx*sz-cx*sy*cz,cy*sz,cx*cz-sx*sy*sz,-(
cx*sy*sz+sx*cz),sy,sx*cy,cx*cy
1640 box_add()=x,x,x,x,x,x,x,x,y,y,y,y,
y,y,y,y,z,z,z,z,z,z,z,z
1650 RESTORE 1740
1660 FOR vertex%=0 TO 7
1670 READ box(0,vertex%),box(1,vertex%)
,box(2,vertex%)
1680 NEXT
1690 box()=box_rot().box()
1700 box()=box()+box_add()
1710 ENDPROC
1720 :
1730 REM Data for box:
1740 DATA -l,-w,-h, l,-w,-h, l,w,-h, -l
,w,-h
1750 DATA -l,-w,h, -l,w,h, l,w,h, l,-w,
h
1760 :
1770 DEF PROCswap_screen
```

Continued ▶

RISC REVUE

◀ Continued

```
1780 SYS "OS_Byte",112,screen%
1790 screen%=screen% EOR 1
1800 WAIT
1810 SYS "OS_Byte",113,screen%
1820 CLS
1830 ENDPROC
1840 :
1850 DEF PROCerror
1860 ON ERROR OFF
1870 *FX 112,0
1880 *FX 113,0
1890 MODE 12
1900 REPORT
1910 PRINT;" at line ";ERL
1920 ENDPROC
1930 :
1940 DEF PROCmisc_variables
1950 DIM view_from(2),view_to(2),view_v
ec(2)
1960 DIM light_from(2),light_to(2),ligh
t_vec(2), n(2)
1970 DIM obj_pos(2),rel_obj_pos(2),rota
te(2,2), img(1)
1980 DIM box(2,7),box_image(1,7),box_ro
t(2,2),box_add(2,7)
1990 DIM vec1(2),vec2(2),vec3(1),vec4(1
)
2000 image_dist%=1500
2010 small=.01
2020 screen%=1
2030 dark%=2
2040 red=3:green=12:blue=48:yellow=15
2050 cyan=60:magenta=51:white=63
2060 ENDPROC
```

Listing 2

```
10 REM >Ln_Log (RR2)
20 REM by Dr Ian Logan
30 REM for Archimedes only
40 REM (c) BAU December 1990
50 :
60 @%=1
70 con1=0.013600954686
80 con2=-0.46490623030000
90 con3=-5.578873750000
100 con4=-0.00021219444008
110 log_exp_1=0.4342944819
120 REPEAT
130 REPEAT
140 INPUT "Enter a number: "n
150 UNTIL n>0
160 n1=n
170 exp=0
180 IF n>=1 THEN
190 REPEAT
200 n1=n1/2
210 exp+=1
220 UNTIL n1<1
230 ENDIF
240 IF n<0.5 THEN
250 REPEAT
260 n1=n1*2
270 exp-=1
280 UNTIL n1>=0.5
290 ENDIF
300 IF n1>0.70703125 THEN
310 z=(n1-1)/(n1/2+0.5)
320 ELSE
330 exp-=1
340 z=(n1-0.5)/(0.5+((n1-0.5)/2))
350 ENDIF
360 z2=z*z
370 ln=z+z*((z2*(con2+con1*z2)/(z2+con
3)))
380 IF exp<>0 THEN ln=exp*355/512+(exp
*con4+ln)
390 log=ln*log_exp_1
400 PRINT "Program - Ln ";n;"=";ln;"
Log ";n;"=";log
410 PRINT "BASIC   - Ln ";n;"=";LN n;"
 Log ";n;"=";LOG n
420 UNTIL FALSE
```

Listing 3

```
11 REM >Stretch+1 (RR3)
12 REM by William Pargeter
50 REM (c) BAU December 1990
2410 mainmenu%=FNmakemen("|winidInfo,"+
FNsub("Selection",selectmenu%)+",|winzmZ
oom,Update,Flip X,Flip Y","Stretch")
2471 PROClight(mainmenu%,4,curobj%>-1)
2472 PROClight(mainmenu%,5,curobj%>-1)
3911 WHEN 4:IF loaded%>0 PROCflip_x
3912 WHEN 5:IF loaded%>0 PROCflip_y
10090 :
10100 DEF PROCflip_x
10110 paths=0
10120 ptr=0
10130 base=block(curobj%)
10140 PROCfileheader
10150 x_temp%=x(curobj%,1)
10160 x_off%=x(curobj%,1)-x(curobj%,4)
10170 x_off1%=x(curobj%,2)-x(curobj%,3)
10180 x(curobj%,1)=x(curobj%,2)
10190 x(curobj%,2)=x_temp%
10200 x(curobj%,4)=x(curobj%,1)+x_off%
10210 x(curobj%,3)=x(curobj%,2)+x_off1%
10220 PROCdistort(block(curobj%),block2(
curobj%),curobj%)
10230 PROCforceredraw(mainhand%)
10240 ENDPROC
10250 :
10260 DEF PROCflip_y
10270 paths=0
10280 ptr=0
10290 base=block(curobj%)
10300 PROCfileheader
10310 y_temp%=y(curobj%,1)
10320 y_off%=y(curobj%,1)-y(curobj%,2)
10330 y_off1%=y(curobj%,4)-y(curobj%,3)
10340 y(curobj%,1)=y(curobj%,4)
10350 y(curobj%,4)=y_temp%
10360 y(curobj%,2)=y(curobj%,1)+y_off%
10370 y(curobj%,3)=y(curobj%,4)+y_off1%
10380 PROCdistort(block(curobj%),block2(
curobj%),curobj%)
10390 PROCforceredraw(mainhand%)
10400 ENDPROC
```

Listing 4

```
13 REM >Stretch+2 (RR4)
14 REM by Tony Patterson
50 REM (c) BAU December 1990
6821 IF corner%>4 THEN
6822 x(curobj%,corner%-4)+=&100*x/scale
+xlo-xlast
6823 y(curobj%,corner%-4)+=&100*y/scale
+ylo-ylast
6824 il%=corner%-5:IF il%=0 il%=4
6825 x(curobj%,il%)+=&100*x/scale+xlo-x
last
6826 y(curobj%,il%)+=&100*y/scale+ylo-y
last
6827 xlast=&100*x/scale+xlo:ylast=&100*
y/scale+ylo
6829 ELSE
6844 ENDIF
7221 il%=4
7231 IF ABS(x-(FNxs(curobj%,i%)+FNxs(cu
robj%,il%))/2)<16 AND ABS(y-(FNys(curobj
%,i%)+FNys(curobj%,il%))/2)<16 THEN
7232 curobj%=j%
7233 corner%=i%+4
7234 dragx%=mousex%
7235 dragy%=mousey%
7236 IF (b% AND 4)=0 dragtype%=1 ELSE d
ragtype%=0
7237 PROCforceredraw(mainhand%)
7238 xlast=&100*x/scale+xlo:ylast=&100*
y/scale+ylo
7239 ENDIF
7311 il%=i%
7733 il%=4
7755 RECTANGLE (FNxs(curobj%,i%)+FNxs(c
urobj%,il%))/2-12,(FNys(curobj%,i%)+FNys
(curobj%,il%))/2-12,32,32
7756 il%=i%
```

Listing 5

```
15 REM >Stretch+3 (RR5)
16 REM by Chris Ruseman
50 REM (c) BAU December 1990
1780 IF loaded%<maxf% PROCmainload("Sel
ection",transptr%) ELSE PROCtellthemoff(
"You may only load "+STR$(maxf%)+" Draw
files")
4931 IF offx%(n%)<0 OR offx%(n%)>=pages
ize% offx%(n%)=16
4932 IF offy%(n%)<0 OR offy%(n%)>=pages
ize% offy%(n%)=16
5270 $FNtextaddr(infohand%,4)="0.60 (27
th Sep 1990)"
```

Listing 6

```
10 REM >Flocking (RR6)
20 REM by Jonathan Lynch
30 REM for Archimedes only
40 REM (c) BAU December 1990
50 :
60 ON ERROR MODE 12:PRINT REPORT$" at
line ";ERL:END
70 MODE 13
80 MODE 9
90 OFF
100 *POINTER 1
110 n%=20
120 s%=1
130 DIM x(n%),y(n%),xv(n%),yv(n%),dx(n
%),dy(n%)
140 DIM xa(n%),ya(n%),rx(n%),ry(n%),ck
(n%),r(n%)
150 FOR c%=1 TO n%
160 x(c%)=RND(1000)-500
170 y(c%)=RND(1000)-500
180 xv(c%)=RND(50)-25
190 yv(c%)=RND(50)-25
200 ck(c%)=RND(10)/(RND(100)+100)
210 r(c%)=ck(c%)*RND(250)
220 NEXT
230 d=0.8
240 ORIGIN 640,512
250 FOR c%=1 TO 15
260 COLOUR c%,c%*10+50,c%*9+100,c%*16
270 NEXT
280 REPEAT
290 PROCscreen
300 PROCmodify
310 PROCprint
320 UNTIL FALSE
330 :
340 DEF PROCscreen
350 SYS "OS_Byte",113,s%
360 s%=s% EOR 3
370 WAIT
380 SYS "OS_Byte",112,s%
390 CLS
400 ENDPROC
410 :
420 DEF PROCmodify
430 MOUSE x%,y%,z%
440 dx()=x%-x()
450 dy()=y%-y()
460 xa()=dx()*ck()
470 ya()=ck()*dy()
480 xv()=xv()*d
490 yv()=yv()*d
500 xv()=xv()+xa()
510 yv()=yv()+ya()
520 xv()=xv()+rx()
530 yv()=yv()+ry()
540 x()=x()+xv()
550 y()=y()+yv()
560 ENDPROC
570 :
580 DEF PROCprint
590 FOR c%=1 TO n%
600 r=SQR((yv(c%))^2+(xv(c%))^2)/8
610 GCOL c%
620 MOVE x(c%),y(c%)
630 DRAW BY xv(c%)/r,yv(c%)/r
640 rx(c%)=RND(r(c%))-RND(r(c%))
650 ry(c%)=RND(r(c%))-RND(r(c%))
660 NEXT
670 ENDPROC
```

EIGHT BITS

Listing 1

```
10 REM View Clock
20 REM by Andrew Pepperell
30 REM for B/B+/M with RTC
40 REM (c) BAU Dec 90
50 :
60 PROCassemble
70 PROCchecksum
80 PROCsave
90 END
100 :
110 DEFPROCsave
120 name$="VClock"
130 OSCLI("SAVE "+name$+" "+STR$~start
+" "+STR$~P%)
140 ENDPROC
150 :
160 DEFPROCchecksum
170 I%=0
180 FOR M%=start TO P%-1
190 I%=I%+?M%
200 NEXT
210 IF I%=14997 ENDPROC
220 VDU 7
230 PRINT "Error in Code, discrepancy:
";ABS(I%-14997)
240 END
250 :
260 DEFPROCassemble
270 oswrch=&FFEE
280 osword=&FFF1
290 osbyte=&FFF4
300 evntv=&220
310 start=&900
320 FOR pass=0 TO 3 STEP 3
330 P%=start
340 [
350 OPT pass
360 SEI
370 LDA #routine MOD 256
380 STA evntv
390 LDA #routine DIV 256
400 STA evntv+1
410 LDA #14
420 LDX #4
430 JSR osbyte
440 CLI
450 RTS
460 .routine
470 PHA
480 TXA
490 PHA
500 TYA
510 PHA
520 PHP
530 LDA counter
540 CLC
550 ADC #1
560 CMP #50
570 BEQ showtime
580 STA counter
590 JMP exit
600 .showtime
610 LDA #0
620 STA clockdata
630 STA counter
640 LDX #clockdata MOD 256
650 LDY #clockdata DIV 256
660 LDA #14
670 JSR osword
680 LDA &318
690 PHA
700 LDA &319
710 PHA
720 LDA #31
730 JSR oswrch
740 LDX &355
750 LDA pos,X
760 JSR oswrch
770 LDA #0
780 JSR oswrch
790 LDX #0
800 .showloop
810 LDA timedigits,X
820 JSR oswrch
830 INX
840 CPX #8
850 BNE showloop
860 PLA
870 STA &319
880 PLA
890 STA &318
900 LDA #31
910 JSR oswrch
920 LDA &318
930 JSR oswrch
940 LDA &319
950 JSR oswrch
960 .exit
970 PLP
980 PLA
990 TAY
1000 PLA
1010 TAX
1020 PLA
1030 RTS
1040 :
1050 .pos
1060 EQUB 36
1070 EQUB 16
1080 EQUB 6
1090 EQUB 36
1100 EQUB 16
1110 EQUB 6
1120 EQUB 16
1130 EQUB 16
1140 .counter
1150 EQUB 0
1160 .clockdata
1170 EQUS STRING$(16," ")
1180 .timedigits
1190 ]
1200 NEXT
1210 ENDPROC
```

Listing 2

```
10 REM View Alarm Clock
20 REM by Andrew Pepperell
30 REM for B/B+/M with RTC
40 REM (c) BAU Dec 90
50 :
```

Continued ▶

EIGHT BITS

◀ **Continued**

```
60 PROCassemble
70 PROCchecksum
80 PROCsave
90 END
100 :
110 DEFPROCsave
120 name$="Alarm"
130 OSCLI("SAVE "+name$+" "+STR$~start
+" "+STR$~P%)
140 ENDPROC
150 :
160 DEFPROCchecksum
170 I%=0
180 FOR M%=start TO P%-1
190 I%=I%+?M%
200 NEXT
210 IF I%=17407 ENDPROC
220 VDU 7
230 PRINT "Error in Code, discrepancy:
";ABS(I%-17407)
240 END
250 :
260 DEFPROCassemble
270 osargs=&FFDA
280 osword=&FFF1
290 osbyte=&FFF4
300 textptr=&A8
310 evntv=&220
320 start=&900
330 FOR pass=0 TO 3 STEP 3
340 P%=start
350 [
360 OPT pass
370 SEI
380 LDA #routine MOD 256
390 STA evntv
400 LDA #routine DIV 256
410 STA evntv+1
420 LDA #14
430 LDX #4
440 JSR osbyte
450 LDY #0
460 LDA #1
470 LDX #textptr
480 JSR osargs
490 LDY #0
500 .getloop
510 LDA (textptr),Y
520 STA alarmtime,Y
530 INY
540 CPY #5
550 BNE getloop
560 CLI
570 RTS
580 .routine
590 PHA
600 TXA
610 PHA
620 TYA
630 PHA
640 PHP
650 LDA counter
660 CLC
670 ADC #1
680 CMP #50
690 BEQ checktime
700 STA counter
710 JMP exit
720 .checktime
730 LDA #0
740 STA clockdata
750 STA counter
760 LDX #clockdata MOD 256
770 LDY #clockdata DIV 256
780 LDA #14
790 JSR osword
800 LDX #0
810 .checkloop
820 LDA currenttime,X
830 CMP alarmtime,X
840 BNE exit
850 INX
860 CPX #5
870 BNE checkloop
880 JMP doalarm
890 .exit
900 PLP
910 PLA
920 TAY
930 PLA
940 TAX
950 PLA
960 RTS
970 :
980 .alarmtime
990 EQUS "00000"
1000 .clockdata
1010 EQUS (STRING$(16,"0"))
1020 .currenttime
1030 EQUS STRING$(9,"0")
1040 .counter
1050 EQUB 0
1060 :
1070 .doalarm
1080 LDX #chime1 MOD 256
1090 LDY #chime1 DIV 256
1100 LDA #7
1110 JSR osword
1120 LDX #chime2 MOD 256
1130 LDY #chime2 DIV 256
1140 LDA #7
1150 JSR osword
1160 SEI
1170 LDA #dummy MOD 256
1180 STA evntv
1190 LDA #dummy DIV 256
1200 STA evntv+1
1210 CLI
1220 JMP exit
1230 .dummy
1240 RTS
1250 :
1260 .chime1
1270 EQUB 1
1280 EQUB 0
1290 EQUB &F1
1300 EQUB 0
1310 EQUB 129
1320 EQUB 0
1330 EQUB 5
1340 EQUB 0
1350 :
1360 .chime2
1370 EQUB 1
1380 EQUB 0
1390 EQUB &F1
1400 EQUB 0
1410 EQUB 113
1420 EQUB 0
1430 EQUB 5
1440 EQUB 0
1450 ]
1460 NEXT
1470 ENDPROC
```

Listing 3

```
10 REM One-line Prime Sieve
20 REM by Phil Bender
30 REM for B/B+/M/C/E
40 REM (c) BAU Dec 90
50 :
60 MODE0:MODE7:HIMEM=&5400:M%=HIMEM:E
%=9999:F%=-1:PRINT 2;:FOR P%=3 TO 99 STE
P 2:IF M%?P%=0 PRINT P%;:FOR J%=P%*P% TO
 E% STEP P%+P%:M%?J%=F%:NEXT:NEXT ELSE N
EXT:FOR P%=101 TO E% STEP 2:IF M%?P%=0 P
RINT P%;:NEXT ELSE NEXT
```

WIREWORLD

Listing 1

```
10 REM Wireworld
20 REM by P D Haynes
30 REM for Archimedes only
40 REM (c) BBC Acorn User December 19
90
50 :
60 DIM code% &FFFF
70 buttons=2:x=3:y=4:mousex=3:mousey=
4:read=5:write=6:zero=7
80 blank=7:head=8:tail=9:wire=10:coun
t=11:base=12
90 sp=13:link=14:pc=15
100 REM Insert *Dir command here
110 FOR pass%=0 TO 2 STEP 2
120 P%=code%
130 [OPT pass%
140 .start
150 STMFD (sp)!,{link}        ; store r
eturn address on stack
160 BL init                   ; sets up
 mode, colours, tables
170 .mainloop
180 BL design                 ; get cir
cuit design
190 BL run                    ; animate
 circuit
200 LDR read,originalptr
210 BL plotgrid
220 B mainloop
230 :
240 .init                     ; initial
isation routine:
250 STMFD (sp)!,{link}        ; store c
all address on stack
260 SWI &100+22
270 SWI &100+1
280 SWI "OS_RemoveCursors"    ; turn cu
rsors off
290 MOV R0,#&C
300 ADR R1,pal1
310 SWI "OS_Word"             ; change
colour 2 to green
320 MOV R0,#&C
330 ADR R1,pal2
340 SWI "OS_Word"             ; change
colour 3 to blue
350 MOV R0,#&C
360 ADR R1,mousecolblock
370 SWI "OS_Word"             ; change
mouse pointer colour to white
380 MOV R0,#&15
390 ADR R1,mouseblock
400 SWI "OS_Word"             ; define
mouse pointer shape
410 MOV zero,#&0              ; set zer
o/blank register to 0
420 LDR R0,originalptr
430 LDR R1,oldgridptr
440 LDR R2,newgridptr
450 LDR R3,fiveonetwoo
460 MOV count,#&0
470 :
480 .cleartableloop
490 STR zero,[R0],#4
500 STR zero,[R1],#4
510 STR zero,[R2],#4
520 ADD count,count,#1
530 CMP count,R3
540 BNE cleartableloop        ; set all
 entries in tables to 0
550 MOV head,#&54
560 MOV tail,#&A8
570 MOV wire,#&FC             ; place a
ppropriate values in id registers
580 ADR R0,vduin
590 ADR R1,vduout
600 SWI "OS_ReadVduVariables"
610 ADR R1,vduout
620 LDR base,[R1]             ; put scr
een base address in register
630 LDMFD (sp)!,{pc}          ; return
to call address+4
640 :
650 .vduin
660 EQUD 148
670 EQUD -1
680 .vduout
690 EQUD 0
700 ALIGN
710 .pal1                     ; data fo
r initialisation routine:
720 EQUB 2
730 EQUW 2
740 EQUW 0
750 ALIGN                     ; data fo
r changing colour 2 to green
760 .pal2
770 EQUB 3
780 EQUW 4
790 EQUW 0
800 ALIGN                     ; data fo
r changing colour 3 to blue
810 .mouseblock
820 EQUB 0
830 EQUB 1
840 EQUB 3
850 EQUB 9
860 EQUB 4
870 EQUB 4
880 EQUD mousedata
890 ALIGN
900 .mousedata
910 EQUB 0: EQUB 1: EQUB 0
920 EQUB 0: EQUB 1: EQUB 0
930 EQUB 0: EQUB 1: EQUB 0
940 EQUB 0: EQUB 0: EQUB 0
950 EQUB 21: EQUB 80: EQUB 1
960 EQUB 0: EQUB 0: EQUB 0
970 EQUB 0: EQUB 1: EQUB 0
980 EQUB 0: EQUB 1: EQUB 0
990 EQUB 0: EQUB 1: EQUB 0
1000 .mousecolblock
1010 EQUB 1
1020 EQUB 25
1030 EQUB 240
1040 EQUB 240
1050 EQUB 240
1060 ALIGN
1070 :
1080 .design                  ; routine
 for designing circuits
1090 STMFD (sp)!,{link}
1100 MOV R0,#&0
1110 STR R0,delay
1120 MOV R0,#&6A
1130 MOV R1,#&1
1140 SWI "OS_Byte"            ; turn mo
use pointer on
1150 .designloop
1160 MOV R0,#15
1170 MOV R1,#1
1180 SWI "OS_Byte"
1190 MOV R0,#&7A
1200 SWI "OS_Byte"            ; scan ke
yboard from 16
1210 CMP R1,#65
1220 LDMEQFD (sp)!,{pc}
1230 CMP R1,#67
1240 MOVEQ R0,#&FF
1250 STREQ R0,delay
1260 LDMEQFD (sp)!,{pc}
1270 CMP R1,#16
1280 SWIEQ &100+22
1290 SWIEQ &100+0
1300 LDMEQFD (sp)!,{R0,pc}
1310 CMP R1,#82
1320 BEQ clear
1330 CMP R1,#81
1340 BEQ save
1350 CMP R1,#86
1360 BEQ load
1370 CMP R1,#51
1380 BEQ remove
1390 CMP R1,#99
1400 BEQ viewlast
1410 LDR write,originalptr
1420 SWI "OS_Mouse"           ; get mou
se coordinates and button states
1430 MOV mousex,R0,LSR #4     ; put mou
se x-coordinate DIV 16 in register
1440 SUB mousey,mousey,#8
1450 MOV mousey,R1,LSR #4     ; put mou
se y-coordinate DIV 16 in register
1460 MOV R0,#80               ; multipl
y mouse y-coordinate by 80, add it
1470 MLA write,mousey,R0,write; to orig
inal table address
1480 ADD write,write,mousex   ; add mou
se x-coordinate to address
1490 CMP buttons,#0
1500 BEQ checkdel
1510 CMP buttons,#1
1520 STREQB tail,[write]      ; if righ
t button pressed, put tail in square
1530 BEQ enddesloop
1540 CMP buttons,#2
1550 STREQB head,[write]      ; if midd
le button pressed, put head in square
1560 BEQ enddesloop
1570 CMP buttons,#4
1580 STREQB wire,[write]
1590 BEQ enddesloop
1600 .checkdel
1610 MOV R0,#&7A
1620 SWI "OS_Byte"
1630 CMP R1,#98
1640 STREQB blank,[write]
1650 .enddesloop
1660 LDR read,originalptr
1670 MOV R2,#3
1680 BL plotgrid              ; plot de
signed grid
1690 B designloop
1700 :
1710 .fiveonetwoo
1720 EQUD 5120
1730 .delay
1740 EQUD 0
1750 :
1760 .run                     ; routine
 to animate circuit:
1770 STMFD (sp)!,{link}
1780 MOV R0,#&6A
1790 MOV R1,#&0
1800 SWI "OS_Byte"            ; turn mo
use pointer off
1810 LDR read,originalptr
1820 LDR write,newgridptr
1830 BL copy
1840 .frameloop
1850 MOV R0,#0
1860 LDR R1,delay
1870 .delayloop
1880 CMP R0,R1,LSL #9
1890 BEQ enddelay
1900 ADD R0,R0,#1
1910 B delayloop
1920 .enddelay
1930 MOV R0,#15
1940 MOV R1,#1
1950 SWI "OS_Byte"
1960 MOV R0,#&7A
1970 SWI "OS_Byte"            ; scan key
board from 16
1980 CMP R1,#&70
1990 LDMEQFD (sp)!,{pc}       ; if Esc p
ressed, return to call address+4
2000 LDR read,newgridptr
2010 LDR write,oldgridptr
2020 BL copy
```

WIREWORLD

◀ Continued

```
2030 LDR read,oldgridptr
2040 LDR write,newgridptr
2050 MOV x,#0
2060 MOV y,#0
2070 .squareloop
2080 LDRB R0,[read]
2090 CMP R0,wire
2100 BNE notwire
2110 MOV count,#0
2120 STMFD (sp)!,{read}
2130 CMP y,#0
2140 BEQ jump1
2150 CMP x,#0
2160 BEQ jump2
2170 SUB read,read,#81
2180 LDRB R1,[read],#81
2190 CMP R1,head
2200 ADDEQ count,count,#1
2210 .jump2
2220 SUB read,read,#80
2230 LDRB R1,[read],#1
2240 CMP R1,head
2250 ADDEQ count,count,#1
2260 CMP x,#79
2270 BEQ jump1
2280 LDRB R1,[read]
2290 CMP R1,head
2300 ADDEQ count,count,#1
2310 .jump1
2320 LDMFD (sp),{read}
2330 CMP x,#0
2340 BEQ jump3
2350 SUB read,read,#1
2360 LDRB R1,[read],#1
2370 CMP R1,head
2380 ADDEQ count,count,#1
2390 .jump3
2400 CMP x,#79
2410 BEQ jump4
2420 LDRB R1,[read,#1]
2430 CMP R1,head
2440 ADDEQ count,count,#1
2450 .jump4
2460 LDMFD (sp),{read}
2470 CMP y,#63
2480 BEQ endjump
2490 CMP x,#0
2500 BEQ jump5
2510 LDRB R1,[read,#79]
2520 CMP R1,head
2530 ADDEQ count,count,#1
2540 :
2550 .jump5
2560 LDRB R1,[read,#80]
2570 CMP R1,head
2580 ADDEQ count,count,#1
2590 CMP x,#79
2600 BEQ endjump
2610 LDRB R1,[read,#81]
2620 CMP R1,head
2630 ADDEQ count,count,#1
2640 .endjump
2650 LDMFD (sp)!,{read}
2660 CMP count,#0
2670 STRGTB head,[write]
2680 STREQB wire,[write]
2690 CMP count,#3
2700 STRGEB wire,[write]
2710 .notwire
2720 CMP R0,head
2730 STREQB tail,[write]
2740 CMP R0,tail
2750 STREQB wire,[write]
2760 ADD read,read,#1
2770 ADD write,write,#1
2780 ADD x,x,#1
2790 CMP x,#80
2800 MOVEQ x,#0
2810 ADDEQ y,y,#1
2820 CMP y,#64
2830 BNE squareloop
2840 LDR read,newgridptr
2850 MOV R2,#0
2860 BL plotgrid
2870 B frameloop
2880 :
2890 .plotgrid                    ; routine
to plot circuit:
2900 STMFD (sp)!,{R2,link}
2910 MOV R0,#19
2920 SWI "OS_Byte"
2930 LDMFD (sp)!,{R2}
2940 MOV x,#0
2950 MOV y,#0
2960 ADR count,lookup
2970 .plotloop
2980 LDRB R0,[read],#1
2990 MOV write,count
3000 ADD write,write,y,LSL #2
3010 LDR R1,[write,x,LSL #8]
3020 ADD R1,R1,base
3030 MOV write,R0
3040 STRB write,[R1,#80]!
3050 STRB write,[R1,#80]!
3060 STRB write,[R1,#80]!
3070 STRB R2,[R1,#80]
3080 .endloop
3090 ADD x,x,#1
3100 CMP x,#80
3110 MOVEQ x,#0
3120 ADDEQ y,y,#1
3130 CMP y,#64
3140 BNE plotloop
3150 MOV R0,#1
3160 LDMFD (sp)!,{pc}
3170 :
3180 .clear                       ; routine
to clear circuit
3190 LDR R0,originalptr
3200 MOV count,#0
3210 LDR R1,fiveonetwoo
3220 .clloop
3230 STR zero,[R0],#4
3240 ADD count,count,#4
3250 CMP count,R1
3260 BNE clloop
3270 B designloop
3280 :
3290 .load
3300 STMFD (sp)!,{link}
3310 BL getfname
3320 MOV R0,#&FF
3330 ADR R1,buffer
3340 LDR R2,originalptr
3350 MOV R3,#0
3360 SWI "XOS_File"
3370 SWIVS &100+7
3380 BL restore
3390 LDMFD (sp)!,{link}
3400 B designloop
3410 :
3420 .save
3430 STMFD (sp)!,{link}
3440 BL getfname
3450 MOV R0,#0
3460 ADR R1,buffer
3470 MOV R2,#0
3480 MOV R3,#0
3490 LDR R4,originalptr
3500 LDR R5,oldgridptr
3510 SWI "XOS_File"
3520 SWIVS &100+7
3530 BL restore
3540 LDMFD (sp)!,{link}
3550 B designloop
3560 :
3570 .getfname
3580 STMFD (sp)!,{link}
3590 SWI &100+12
3600 MOV R0,&C
3610 ADR R1,pal3
3620 SWI "OS_Word"
3630 ADR R0,catstr
3640 SWI "OS_CLI"
3650 SWI "OS_NewLine"
3660 SWI "OS_NewLine"
3670 SWI "OS_WriteS"
3680 EQUS "Enter filename: "
3690 EQUB 0
3700 ALIGN
3710 SWI "OS_RestoreCursors"
3720 MOV R0,#&6A
3730 MOV R1,#&0
3740 SWI "OS_Byte"
3750 MOV R0,#15
3760 MOV R1,#1
3770 SWI "OS_Byte"
3780 STR zero,buffer
3790 STR zero,buffer+4
3800 STR zero,buffer+8
3810 ADR R0,buffer
3820 MOV R1,#10
3830 MOV R2,#32
3840 MOV R3,#126
3850 SWI "OS_ReadLine"
3860 SWICS &100+7
3870 BLCS restore
3880 LDMFD (sp)!,{link}
3890 BCS designloop
3900 MOV pc,link
3910 .restore
3920 STMFD (sp)!,{link}
3930 MOV R0,#&7E
3940 SWI "OS_Byte"
3950 MOV R0,#&C
3960 ADR R1,pal4
3970 SWI "OS_Word"
3980 LDR read,originalptr
3990 BL plotgrid
4000 SWI "OS_RemoveCursors"
4010 MOV R0,#&6A
4020 MOV R1,#&1
4030 SWI "OS_Byte"
4040 SWI &100+12
4050 LDMFD (sp)!,{pc}
4060 :
4070 .remove
4080 STMFD (sp)!,{link}
4090 LDR R0,originalptr
4100 MOV count,#0
4110 LDR R2,fiveonetwoo
4120 .remloop
4130 LDRB R1,[R0]
4140 CMP R1,head
4150 STREQB wire,[R0]
4160 CMP R1,tail
4170 STREQB wire,[R0]
4180 ADD R0,R0,#1
4190 ADD count,count,#1
4200 CMP count,R2
4210 BNE remloop
4220 LDR read,originalptr
4230 BL plotgrid
4240 LDMFD (sp)!,{link}
4250 B designloop
4260 :
4270 .viewlast
4280 STMFD (sp)!,{link}
4290 LDR read,newgridptr
4300 LDR write,originalptr
4310 BL copy
4320 LDR read,originalptr
4330 BL plotgrid
4340 LDMFD (sp)!,{link}
4350 B designloop
4360 :
4370 .copy
4380 LDR count,fiveonetwoo
4390 LDR R1,fiveonetwoo
4400 .copyloop
4410 LDR R0,[read],#4
4420 STR R0,[write],#4
4430 SUBS count,count,#4
4440 BNE copyloop
4450 MOV pc,link
4460 :
4470 .catstr
4480 EQUS "CAT"
4490 EQUB 0
4500 .buffer
4510 EQUS STRING$(12,CHR$(0))
4520 ALIGN
4530 .pal3
4540 EQUB 3
4550 EQUW 7
4560 EQUW 0
4570 ALIGN
4580 .pal4
4590 EQUB 3
4600 EQUW 4
4610 EQUW 0
4620 ALIGN
4630 :
4640 .originalptr
4650 EQUD original
4660 .oldgridptr
4670 EQUD oldgrid
4680 .newgridptr
4690 EQUD newgrid
4700 .lookup
4710 ]
4720 FOR x%=0 TO 79
4730 FOR y%=0 TO 63
4740 !P%=(63-y%)*320+x%
4750 P%+=4
4760 NEXT ,
4770 [OPT pass%
4780 .original
4790 ]
4800 P%+=5120
4810 [OPT pass%
4820 .oldgrid
4830 ]
4840 P%+=5120
4850 [OPT pass%
4860 .newgrid
4870 ]
4880 P%+=5120
4890 NEXT
4900 ON ERROR QUIT
4910 CALL start
```

Listing 2

```
  10 REM WireWorld Sprite Converter
  20 REM by P.D.Haynes
  30 REM for Archimedes only
  40 REM (c) BAU December 1990
  50 :
  60 MODE 0
  70 ON ERROR IF ERR=17 THEN MODE 0:END
 ELSE PRINT 'REPORT$;" at line ";ERL:END
  80 DIM memory% 5120
  90 *SNew
 100 PRINT '"W I R E W O R L D   S P R
 I T E   C O N V E R S I O N"'
 110 VDU 28,0,31,79,2
 120 PRINT ''"(1)  Convert sprite file
to WireWorld file"'"(2)  Convert WireWor
ld file to sprite file"'"(3)  Quit progr
am"
 130 INPUT ''"Enter option => " option%
 140 IF option%<1 OR option%>3 THEN CLS
:GOTO 120
 150 IF option%=3 THEN MODE 0:END
 160 IF option%=1 THEN PROCsprtoww ELSE
 PROCwwtospr
 170 CLS
 180 GOTO 120
 190 :
 200 DEF PROCsprtoww
 210 PROCgetfname(TRUE)
 220 SYS "OS_File",&11,path$ TO ,,type%
 230 type%=(type% AND &FFF00) >> 8
 240 IF type%<>&FF9 THEN path$=oldpath$
:GOTO 240
 250 OSCLI("SLoad "+path$)
 260 CLS
 270 PRINT
 280 *SList
 290 INPUT '"Enter name of sprite: " sn
ame$
 300 SYS "OS_SpriteOp",40,,sname$ TO ,,
,x%,y%
 310 IF x%>80 THEN x%=80
 320 IF y%>64 THEN y%=64
 330 CLS
 340 PRINT '"Converting sprite...";
 350 OFF
 360 p%=POS:v%=VPOS
 370 FOR m%=memory% TO memory%+5120 STE
P 4
 380 !m%=0
 390 NEXT
 391 :
 400 FOR a%=0 TO x%-1
 410 FOR b%=0 TO y%-1
 420 SYS "OS_SpriteOp",41,,sname$,a%,b%
 TO ,,,,,c%
 430 IF c%>3 THEN c%=0
 440 memory%?((b%*80)+a%)=c%*84
 450 PRINT TAB(p%,v%);INT(((a%*80)+b%)/
(((x%-1)*80)+(y%-1))*100);"%"
 460 NEXT:NEXT
 470 ON
 480 PROCgetfname(FALSE)
 490 ch%=OPENIN(path$)
 500 CLOSE #ch%
 510 IF ch%<>0 THEN
 520 INPUT '"Replace existing file (Y/N
)? " yn$
 530 IF yn$="Y" OR yn$="y" THEN yn%=TRU
E ELSE yn%=FALSE
 540 ELSE yn%=TRUE
 550 ENDIF
 560 IF NOT yn% THEN GOTO 480
 570 OSCLI("Save "+path$+" "+STR$~memor
y%+" "+STR$~(memory%+5120))
 580 CLS
 590 INPUT '"Convert another sprite fro
m this file (Y/N)? " yn$
 600 IF yn$="Y" OR yn$="y" THEN 260
 610 ENDPROC
 620 :
 630 DEF PROCgetfname(b%)
 640 LOCAL ret%,load%,ch%
 650 LOCAL ERROR
 660 ON ERROR IF ERR=17 THEN MODE 0:END
 ELSE path$=oldpath$:GOTO 680
 670 path$="$":oldpath$="$"
 680 CLS
 690 PRINT '"> <directory name> to move
 into new directory"
 700 PRINT "<                  to move
 up into parent directory"
 710 PRINT ": <drive number>   to chan
ge disc drive"'
 720 OSCLI("CAT "+path$)
 730 IF b% THEN PRINT '"LOAD FILE" ELSE
 PRINT '"SAVE FILE"
 740 INPUT '"Enter filename or command:
 " com$
 750 com$=FNspaces(com$)
 760 load%=FALSE
 770 CASE LEFT$(com$,1) OF
 780 WHEN ">" : PROCdown
 790 WHEN "<" : PROCup
 800 WHEN ":" : PROCdisc
 810 OTHERWISE: path$+="."+com$
 820 load%=TRUE
 830 ENDCASE
 840 IF NOT load% THEN 680
 850 ret%=FALSE
 860 IF b% THEN
 870 ch%=OPENIN(path$)
 880 CLOSE #ch%
 890 IF ch%=0 THEN path$=oldpath$:ret%=
TRUE
 900 ENDIF
 910 IF ret% THEN 680
 920 RESTORE ERROR
 930 ENDPROC
 940 :
 950 DEF FNspaces(t$)
 960 WHILE LEFT$(t$,1)=" "
 970 t$=RIGHT$(t$,LEN(t$)-1)
 980 ENDWHILE
 990 =t$
1000 :
1010 DEF PROCdown
1020 LOCAL dir$,ch%
1030 dir$=FNspaces(RIGHT$(com$,LEN(com$
)-1))
1040 ch%=OPENIN(path$+"."+dir$)
1050 CLOSE #ch%
1060 IF ch%=0 THEN ENDPROC
1070 oldpath$=path$
1080 path$+="."+dir$
1090 ENDPROC
1100 :
1110 DEF PROCup
1120 IF path$="$" THEN ENDPROC
1130 path$+=".^"
1140 ENDPROC
```

Continued ▶

WIREWORLD

◀ Continued

```
 1150 :
 1160 DEF PROCdisc
 1170 LOCAL disc%
 1180 disc%=VAL(RIGHT$(com$,LEN(com$)-1)
)
 1190 IF disc%<0 OR disc%>5 THEN ENDPROC
 1200 OSCLI("Mount "+STR$(disc%))
 1210 ENDPROC
 1220 :
 1230 DEF PROCwwtospr
 1240 PROCgetfname(TRUE)
 1250 ch%=OPENIN(path$)
 1260 IF (EXT #ch%)<>5120 THEN CLOSE #ch
%:GOTO 1240
 1270 *SNew
 1280 CLS
 1290 PRINT '"Converting WireWorld file.
..";
 1300 OFF
 1310 p%=POS:v%=VPOS
 1320 SYS "OS_SpriteOp",15,0,"WireWorld"
,0,80,64,1
 1330 OSCLI("Load "+path$+" "+STR$~memor
y%)
 1340 FOR a%=0 TO 79
 1350 FOR b%=0 TO 63
 1360 c%=memory%?((b%*80)+a%)/84
 1370 SYS "OS_SpriteOp",42,,"WireWorld",
a%,b%,c%
 1380 PRINT TAB(p%,v%);INT(((a%*80)+b%)/
6383*100);"%"
 1390 NEXT:NEXT
 1400 ON
 1410 PROCgetfname(FALSE)
 1420 ch%=OPENIN(path$)
 1430 CLOSE #ch%
 1440 IF ch%<>0 THEN
 1450 INPUT '"Replace existing file (Y/N
)? " yn$
 1460 IF yn$="Y" OR yn$="y" THEN yn%=TRU
E ELSE yn%=FALSE
 1470 ELSE yn%=TRUE
 1480 ENDIF
 1490 IF NOT yn% THEN GOTO 1410
 1500 OSCLI("SSave "+path$)
 1510 ENDPROC
```

PICPAC

Listing 1

```
   1Ø REM Picpac Listing 6
   2Ø REM Load Screen into Picpac
   3Ø REM by James Richards
   4Ø REM for B/B+/M/C/E with ADFS
   5Ø REM (c) BBC Acorn User December 19
9Ø
   6Ø :
   7Ø ON ERROR MODE 6:PROCerror
   8Ø *FX 15,Ø
   9Ø *FX 229,Ø
  1ØØ CLS
  11Ø PRINT'''
  12Ø OSCLI "Dir $."+STR$(M%)
  13Ø *CAT
  14Ø INPUT'''"Filename : "file$
  15Ø IF file$="" THEN 28Ø
  16Ø IF LEN(file$)>1Ø THEN PRINT''"File
 does not exist":PROCdelay:RUN
  17Ø in%=OPENIN file$
  18Ø len%=EXT#in%
  19Ø CLOSE #in%
  2ØØ IF len%=Ø THEN PRINT''"File does n
ot exist":PROCdelay:RUN
  21Ø :
  22Ø MODE M%
  23Ø VDU 23;82Ø2;Ø;Ø;Ø;
  24Ø IF M%<3 THEN himem%=&3ØØØ
  25Ø IF M%>3 THEN himem%=&58ØØ
  26Ø OSCLI "LOAD "+file$
  27Ø OSCLI "SAVE Wkfile "+STR$~himem%+"
 8ØØØ"
  28Ø *DIR $.Picpac
  29Ø CHAIN"Menu"
  3ØØ :
  31Ø DEF PROCdelay
  32Ø NOW=TIME
  33Ø REPEAT UNTIL TIME-NOW>2ØØ
  34Ø ENDPROC
  35Ø :
  36Ø DEF PROCerror
  37Ø IF ERR=17 THEN CHAIN"Menu"
  38Ø PRINT'''
  39Ø REPORT
  4ØØ PRINT;" at line ";ERL
  41Ø OSCLI "KEY Ø LIST "+STR$(ERL)+"|M"
  42Ø *FX 138,Ø,128
  43Ø END
```

Listing 2

```
   1Ø REM Pipcac Listing 7
   2Ø REM Save Screen
   3Ø REM by James Richards
   4Ø REM for B/B+/M/C/E with ADFS
   5Ø REM (c) BBC Acorn User December 19
9Ø
   6Ø :
   7Ø *FX229,Ø
   8Ø ON ERROR MODE 6:PROCerror
   9Ø CLS
  1ØØ PRINT'''
  11Ø OSCLI "DIR $."+STR$(M%)
  12Ø *CAT
  13Ø *FX 15,Ø
  14Ø INPUT'''"Save to filename : "file$
  15Ø IF file$="" THEN 28Ø
  16Ø IF LEN(file$)>1Ø THEN PRINT"Ten ch
aracters only please":PROCdelay:RUN
  17Ø in%=OPENIN file$
  18Ø len%=EXT#in%
  19Ø CLOSE #Ø
  2ØØ IF len%<>Ø THEN PROCcheck
  21Ø MODE M%
  22Ø VDU23;82Ø2;Ø;Ø;Ø;
  23Ø IF M%<3 THEN himem%=&3ØØØ
  24Ø IF M%>3 THEN himem%=&58ØØ
  25Ø OSCLI "LOAD Wkfile"
  26Ø PROCclearbottom
  27Ø OSCLI "SAVE "+file$+" "+STR$~himem
%+" 8ØØØ"
  28Ø *DIR $.PicPac
  29Ø CHAIN"Menu"
  3ØØ :
  31Ø DEF PROCclearbottom
  32Ø GCOLØ,128
  33Ø VDU24,Ø;Ø;1279;36
  34Ø CLG
  35Ø VDU26
  36Ø ENDPROC
  37Ø :
  38Ø DEF PROCcheck
  39Ø PRINT''
  4ØØ PRINT"File exists.  Carry on (Y/N)
?"
  41Ø *FX 15,Ø
  42Ø key$=GET$
  43Ø IF key$="N" OR key$="n" THEN RUN
  44Ø ENDPROC
  45Ø :
  46Ø DEF PROCdelay
  47Ø NOW=TIME
  48Ø REPEAT UNTIL TIME-NOW>2ØØ
  49Ø ENDPROC
  5ØØ :
  51Ø DEF PROCerror
  52Ø IF ERR=17 THEN CHAIN"Menu"
  53Ø PRINT'''
  54Ø REPORT
  55Ø PRINT;" at line ";ERL
  56Ø OSCLI "KEY Ø LIST "+STR$(ERL)+"|M"
  57Ø *FX 138,Ø,128
  58Ø END
```

Listing 3

```
   1Ø REM Picpac Listing 8
   2Ø REM Process Star command
   3Ø REM by James Richards
   4Ø REM for B/B+/M/C/E with ADFS
   5Ø REM (c) BBC Acorn User December 19
9Ø
   6Ø :
   7Ø MODE 6
   8Ø *FX 229,Ø
   9Ø *FX 4,Ø
  1ØØ ON ERROR IF ERR=17 THEN PROCend EL
SE PROCerror
  11Ø REPEAT
  12Ø PROCinput
  13Ø PROCoscli
  14Ø UNTIL FALSE
  15Ø :
  16Ø DEF PROCinput
  17Ø *FX15,Ø
  18Ø PRINT'
  19Ø INPUT"*"oscli$
  2ØØ ENDPROC
  21Ø :
  22Ø DEF PROCoscli
  23Ø OSCLI oscli$
  24Ø ENDPROC
  25Ø :
  26Ø DEF PROCend
  27Ø *FX2ØØ,Ø
  28Ø *FX13,6
  29Ø *FX229,Ø
  3ØØ *ADFS
  31Ø *DIR :Ø.$.PicPac
  32Ø CHAIN"Menu"
  33Ø :
  34Ø DEF PROCerror
  35Ø PRINT'
  36Ø REPORT
  37Ø PRINT'
  38Ø ENDPROC
```

Listing 4

```
   1Ø REM Picpac Listing 9
   2Ø REM Circles/Curves
   3Ø REM by James Richards
   4Ø REM for B/B+/M/C/E with ADFS
   5Ø REM (c) BBC Acorn User December 19
9Ø
   6Ø :
   7Ø ON ERROR PROCerror
   8Ø PROCinit
   9Ø VDU7
  1ØØ REPEAT
  11Ø IF r%=r1% THEN plot%=21 ELSE plot%
=6
  12Ø oplot%=plot%
  13Ø ox%=x%
  14Ø oy%=y%
  15Ø or%=r%
  16Ø or1%=r1%
  17Ø PROCprintcursor
  18Ø PROCkeys
  19Ø PROCrubcursor
  2ØØ UNTIL exit%=TRUE
  22Ø CHAIN"Bootstr"
  24Ø :
  25Ø DEF PROCkeys
  26Ø k%=FALSE
  27Ø REPEAT
  28Ø PROCspeedcheck
  29Ø PROCcheckcol
  3ØØ IF INKEY(-99) THEN PROCtempcirc
  31Ø IF INKEY(-74) THEN PROCsetcircle
  32Ø IF INKEY(-83) THEN PROCrubcursor:P
ROCcompasses:PROCprintcursor
  33Ø IF INKEY(-68) THEN fill%=NOT fill%
:PROCdelay:VDU7:PROCadjfill
  34Ø IF INKEY(-1) THEN PROCradius:GOTO
41Ø
  35Ø :
  36Ø IF INKEY(-73) THEN y%=y%+s%:k%=TRU
E
  37Ø IF INKEY(-1Ø5) THEN y%=y%-s%:k%=TR
UE
  38Ø IF INKEY(-98) THEN x%=x%-s%:k%=TRU
E
  39Ø IF INKEY(-67) THEN x%=x%+s%:k%=TRU
E
  4ØØ :
  41Ø IF INKEY(-38) THEN PROCload
  42Ø IF INKEY(-55) THEN PROCsave
  43Ø :
  44Ø IF INKEY(-113) THEN exit%=TRUE:k%=
TRUE
  45Ø UNTIL k%=TRUE
  46Ø ENDPROC
  47Ø :
  48Ø DEF PROCcheckcol
  49Ø IF INKEY(-26) THEN col%=col%-1:PRO
Cadjpalatte
  5ØØ IF INKEY(-122) THEN col%=col%+1:PR
OCadjpalatte
  51Ø ENDPROC
  52Ø :
  53Ø DEF PROCradius
  54Ø IF INKEY(-67) THEN r%=r%-s%:k%=TRU
E
  55Ø IF INKEY(-98) THEN r%=r%+s%:k%=TRU
E
  56Ø IF INKEY(-73) THEN r1%=r1%+s%:k%=T
RUE
  57Ø IF INKEY(-1Ø5) THEN r1%=r1%-s%:k%=
TRUE
  58Ø IF r%<12 THEN r%=12
  59Ø IF r1%<12 THEN r1%=12
  6ØØ ENDPROC
  61Ø :
  62Ø DEF PROCspeedcheck
  63Ø IF INKEY(-49) THEN s%=4:SOUND1,-15
,1ØØ,1
  64Ø IF INKEY(-5Ø) THEN s%=8:SOUND1,-15
,1ØØ,1
  65Ø IF INKEY(-18) THEN s%=16:SOUND1,-1
5,1ØØ,1
  66Ø IF INKEY(-19) THEN s%=32:SOUND1,-1
5,1ØØ,1
  67Ø ENDPROC
  68Ø :
  69Ø DEF PROCprintcursor
  7ØØ GCOL 3,7
  71Ø MOVE x%-r%,y%
  72Ø PLOT plot%,x%+r%,y%
  73Ø MOVE x%,y%-r1%
  74Ø PLOT plot%,x%,y%+r1%
  75Ø ENDPROC
  76Ø :
  77Ø DEF PROCrubcursor
  78Ø GCOL 3,7
  79Ø MOVE ox%-or%,oy%
  8ØØ PLOT oplot%,ox%+or%,oy%
  81Ø MOVE ox%,oy%-or1%
  82Ø PLOT oplot%,ox%,oy%+or1%
  83Ø ENDPROC
  84Ø :
  85Ø DEF PROCsetcircle
  86Ø PROCrubcursor
  87Ø GCOL Ø,col%
  88Ø PROCcircle(x%,y%,r%,r1%)
  89Ø PROCprintcursor
  9ØØ ENDPROC
  91Ø :
  92Ø DEF PROCadjpalatte
  93Ø IF col%>15 THEN col%=Ø
  94Ø IF col%<Ø THEN col%=15
  95Ø GCOLØ,128+col%
  96Ø VDU24,1247;Ø;1279;32;
  97Ø CLG
  98Ø GCOLØ,128
  99Ø VDU26,24,Ø;36;1279;1Ø23;
 1ØØØ GCOLØ,col%
 1Ø1Ø PROCdelay
 1Ø2Ø ENDPROC
 1Ø3Ø :
 1Ø4Ø DEF PROCtempcirc
 1Ø5Ø GCOL3,7
 1Ø6Ø PROCcircle(x%,y%,r%,r1%)
 1Ø7Ø *FX 15,Ø
 1Ø8Ø key$=GET$
 1Ø9Ø PROCcircle(x%,y%,r%,r1%)
 11ØØ ENDPROC
 111Ø :
 112Ø DEF PROCcircle(cx%,cy%,cr%,cr1%)
 113Ø MOVE cx%,cy%+r1%
 114Ø FOR l%=Ø TO 36
 115Ø IF fill%=TRUE THEN MOVE cx%,cy%:PL
OT 85,sin(l%)*cr%+cx%,cos(l%)*cr1%+cy%
 116Ø IF fill%=FALSE THEN DRAW sin(l%)*c
r%+cx%,cos(l%)*cr1%+cy%
 117Ø NEXT l%
 118Ø ENDPROC
 119Ø :
 12ØØ DEF PROCcompasses
 121Ø REPEAT
 122Ø PROCcheckcol
 123Ø PROCcomcursor
 124Ø oang%=ang%
 125Ø IF INKEY(-1Ø4) THEN PROCtempcursor
 126Ø IF INKEY(-68) THEN fill%=NOT fill%
:PROCdelay:VDU7:PROCadjfill
 127Ø IF INKEY(-98) THEN ang%=ang%-1
 128Ø IF INKEY(-67) THEN ang%=ang%+1
 129Ø IF ang%<1 THEN ang%=36
 13ØØ IF ang%>36 THEN ang%=1
 131Ø IF INKEY(-74) THEN PROCdraw ELSE P
ROCmove
 132Ø UNTIL INKEY(-9Ø)
 133Ø ENDPROC
 134Ø :
 135Ø DEF PROCdraw
 136Ø GCOLØ,col%
 137Ø MOVE sin(oang%)*r%+x%,cos(oang%)*r
1%+y%
 138Ø IF fill%=TRUE THEN MOVE x%,y%:PLOT
 85,sin(ang%)*r%+x%,cos(ang%)*r1%+y%
 139Ø IF fill%=FALSE THEN DRAW sin(ang%)
*r%+x%,cos(ang%)*r1%+y%
 14ØØ ENDPROC
 141Ø :
 142Ø DEF PROCmove
 143Ø MOVE sin(ang%)*r%+x%,cos(ang%)*r1%
+y%
 144Ø ENDPROC
 145Ø :
 146Ø DEF PROCtempcursor
 147Ø PROCprintcursor
 148Ø *FX 15,Ø
 149Ø key$=GET$
 15ØØ PROCrubcursor
 151Ø ENDPROC
 152Ø :
 153Ø DEF PROCcomcursor
 154Ø GCOL3,7
 155Ø FOR loop%=Ø TO 1
 156Ø MOVE sin(ang%)*r%+x%-8,cos(ang%)*r
1%+y%
 157Ø DRAW sin(ang%)*r%+x%+8,cos(ang%)*r
1%+y%
 158Ø MOVE sin(ang%)*r%+x%,cos(ang%)*r1%
+y%-8
 159Ø DRAW sin(ang%)*r%+x%,cos(ang%)*r1%
+y%+8
 16ØØ NEXT loop%
 161Ø ENDPROC
```

Continued ▶

PICPAC

◀ **Continued**

```
 1620 :
 1630 DEF PROCadjfill
 1640 IF fill%=TRUE THEN PRINTTAB(16,31)
;CHR$225;
 1650 IF fill%=FALSE THEN PRINTTAB(16,31
);CHR$224;
 1660 ENDPROC
 1670 :
 1680 DEF PROCdelay
 1690 NOW=TIME
 1700 REPEAT UNTIL TIME-NOW>20
 1710 ENDPROC
 1720 :
 1730 DEF PROCload
 1740 CHAIN"Icondrive"
 1750 ENDPROC
 1760 :
 1770 DEF PROCsave
 1780 PROCrubcursor
 1790 IF M%<3 THEN himem%=&3000
 1800 IF M%>3 THEN himem%=&5800
 1810 OSCLI "SAVE $."+STR$(M%)+".wkfile
"+STR$~(himem%)+" 8000"
 1820 PROCprintcursor
 1830 ENDPROC
 1840 :
 1850 DEF PROCinit
 1860 VDU 23,224,24,36,66,129,129,66,36,
24
 1870 VDU 23,225,24,60,126,255,255,126,6
0,24
 1880 VDU23;8202;0;0;0;
 1890 *FX 229,1
 1900 *FX 4,1
 1910 fill%=FALSE
 1920 PROCadjfill
 1930 col%=7
 1940 PROCadjpalatte
 1950 s%=16
 1960 x%=640:y%=512
 1970 r%=32:r1%=32
 1980 plot%=22
 1990 ang%=0
 2000 exit%=FALSE
 2010 point%=0
 2020 DIM sin(36),cos(36)
 2030 FOR loopang%=0 TO 360 STEP 10
 2040 sin(point%)=SINRAD(loopang%)
 2050 cos(point%)=COSRAD(loopang%)
 2060 point%=point%+1
 2070 NEXT
 2080 ENDPROC
 2090 :
 2100 DEF PROCerror
 2110 VDU7
 2120 VDU7
 2130 VDU28,0,31,19,30
 2140 CLS
 2150 PRINT"An error has occuredSave scr
een (Y/N)";
 2160 PROCdelay:PROCdelay
 2170 REPEAT
 2180 *FX15,0
 2190 key$=GET$
 2200 UNTIL INSTR("YN",key$)>0
 2210 IF key$="N" THEN GOTO2230
 2220 OSCLI "Save $."+STR$~M%+".Emergenc
y 3000 8000"
 2230 VDU26
 2240 CLS
 2250 PRINT'''
 2260 REPORT:PRINT;" at line ";ERL
 2270 OSCLI "KEY 0 LIST "+STR$(ERL)+"|M"
 2280 *FX138,0,128
 2290 END
```

Listing 4

```
   10 REM Picpac Listing 10
   20 REM Text routine
   30 REM by James Richards
   40 REM for B/B+/M/C/E with ADFS
   50 REM (c) BBC Acorn User December 19
90
   60 :
   70 ON ERROR PROCerror
   80 PROCinit
   90 REPEAT
  100 PROCline
  110 PROCkeys
  120 UNTIL INKEY(-113)
  130 CHAIN"Bootstr"
  140 :
  150 DEF PROCline
  160 GCOL3,7
  170 FOR loop%=0 TO 1
  180 MOVE x%,y%
  190 DRAW x%,y%-32
  200 IF loop%=0 THEN PROCdelay(3)
  210 NEXT loop%
  220 ENDPROC
  230 :
  240 DEF PROCkeys
  250 IF INKEY(-99) THEN PROCprint
  260 IF INKEY(-83) THEN PROCcenline
  270 IF INKEY(-1) THEN s%=32 ELSE s%=4
  280 :
  290 IF INKEY(-98) THEN x%=x%-s%
  300 IF INKEY(-67) THEN x%=x%+s%
  310 IF INKEY(-73) THEN y%=y%+s%
  320 IF INKEY(-105) THEN y%=y%-s%
  330 :
  340 IF INKEY(-26) THEN col%=col%+1:PRO
Cadjpalatte
  350 IF INKEY(-122) THEN col%=col%-1:PR
OCadjpalatte
  360 :
  370 IF x%>1279 THEN x%=1279
  380 IF x%<0 THEN x%=0
  390 IF y%>1023 THEN y%=1023
  400 IF y%<64 THEN y%=64
  410 ENDPROC
  420 :
  430 DEF PROCadjpalatte
  440 IF col%>15 THEN col%=0
  450 IF col%<0 THEN col%=15
  460 GCOL0,128+col%
  470 VDU 24,1200;0;1279;34;
  480 CLG
  490 VDU26
  500 GCOL0,col%
  510 GCOL0,128
  520 PROCdelay(30)
  530 ENDPROC
  540 :
  550 DEF PROCinit
  560 IF M%=4 OR M%=1 THEN lw%=32
  570 IF M%=5 OR M%=2 THEN lw%=64
  580 IF M%=0 THEN lw%=16
  590 VDU23;8202;0;0;0;
  600 *FX229,1
  610 *FX4,1
  620 DIM letter$(80)
  630 x%=640
  640 y%=512
  650 col%=7
  660 PROCadjpalatte
  670 ENDPROC
  680 :
  690 DEF PROCdelay(time%)
  700 NOW=TIME
  710 REPEAT UNTIL TIME-NOW>time%
  720 ENDPROC
  730 :
  740 DEF PROCprint
  750 SOUND1,-15,1,3
  760 PROCdelay(10)
  770 PROCinput
  780 VDU28,0,31,16,31
  790 PROCprintcenline
  800 SOUND1,-15,30,3
  810 PRINT'"Press 'S C R L'";
  820 PROCdelay(10)
  830 *FX15,0
  840 key$=GET$
  850 PRINT
  860 SOUND1,-15,60,3
  870 IF key$="S" OR key$="s" THEN PROCr
ubcenline:PROCset:ENDPROC
  880 IF key$="L" OR key$="l" THEN PROCr
ubcenline:ENDPROC
  890 IF key$="C" OR key$="c" THEN PROCc
enjust:ENDPROC
  900 PROCrubcenline
  910 VDU5
  920 MOVE x%,y%
  930 PRINTtext$
  940 VDU4
  950 ENDPROC
  960 :
  970 DEF PROCset
  980 VDU5
  990 GCOL3,7
 1000 MOVEx%,y%
 1010 PRINTtext$
 1020 GCOL0,col%
 1030 MOVEx%,y%
 1040 PRINTtext$
 1050 VDU4
 1060 ENDPROC
 1070 :
 1080 DEF PROCinput
 1090 *FX15,0
 1100 VDU5
 1110 MOVE x%,y%
 1120 GCOL 3,7
 1130 key$=""
 1140 letterc%=0
 1150 end%=FALSE
 1160 REPEAT
 1170 key$=GET$
 1180 IF ASC(key$)=127 THEN PROCdel:GOTO
 1240
 1190 IF ASC(key$)=13 THEN end%=TRUE:GOT
01240
 1200 letterc%=letterc%+1
 1210 IF letterc%>79 THEN end%=TRUE
 1220 letter$(letterc%)=key$
 1230 VDU ASC(letter$(letterc%))
 1240 UNTIL end%=TRUE
 1250 PROCtransintostring
 1260 VDU4
 1270 ENDPROC
 1280 :
 1290 DEF PROCtransintostring
 1300 text$=""
 1310 FOR loop%=0 TO letterc%
 1320 text$=text$+letter$(loop%)
 1330 NEXT loop%
 1340 ENDPROC
 1350 :
 1360 DEF PROCdel
 1370 IF letterc%=0 THEN SOUND1,-15,100,
3:ENDPROC
 1380 letterc%=letterc%-1
 1390 GCOL3,7
 1400 MOVE x%+(letterc%*lw%),y%
 1410 VDU ASC(letter$(letterc%+1))
 1420 MOVE x%+(letterc%*lw%),y%
 1430 ENDPROC
 1440 :
 1450 DEF PROCcenjust
 1460 VDU5
 1470 GCOL3,7
 1480 MOVE x%,y%
 1490 PRINTtext$
 1500 len%=LEN(text$)*lw%
 1510 MOVE C%-(len%/2),y%
 1520 PRINTtext$
 1530 VDU4
 1540 PRINT'"Centred 'S R L'";
 1550 PROCdelay(40)
 1560 *FX15,0
 1570 key$=GET$
 1580 CLS
 1590 SOUND1,-15,120,3
 1600 PROCrubcenline
 1610 IF key$="S" OR key$="s" THEN PROCs
etcentre
 1620 IF key$="R" OR key$="r" THEN PROCc
entrerub
 1630 ENDPROC
 1640 :
 1650 DEF PROCsetcentre
 1660 GCOL3,7
 1670 VDU5
 1680 MOVE C%-(len%/2),y%
 1690 PRINTtext$
 1700 GCOL0,col%
 1710 MOVE C%-(len%/2),y%
 1720 PRINTtext$
 1730 VDU4
 1740 ENDPROC
 1750 :
 1760 DEF PROCcentrerub
 1770 GCOL3,7
 1780 VDU5
 1790 MOVE C%-(len%/2),y%
 1800 PRINTtext$
 1810 VDU4
 1820 ENDPROC
 1830 :
 1840 DEF PROCcenline
 1850 VDU4
 1860 VDU28,0,31,16,31
 1870 PRINT'"Set centre";
 1880 SOUND1,-15,150,3
 1890 PROCdelay(50)
 1900 REPEAT
 1910 IF INKEY(-1) THEN s%=32 ELSE s%=4
 1920 IF INKEY(-98) THEN C%=C%-s%
 1930 IF INKEY(-67) THEN C%=C%+s%
 1940 IF INKEY(-83) THEN C%=640
 1950 IF C%<0 THEN C%=0
 1960 IF C%>1279 THEN C%=1279
 1970 PROCprintcenline
 1980 PROCrubcenline
 1990 UNTIL INKEY(-74)
 2000 PRINT
 2010 ENDPROC
 2020 :
 2030 DEF PROCprintcenline
 2040 MOVE C%,36
 2050 PLOT 21,C%,1023
 2060 ENDPROC
 2070 :
 2080 DEF PROCrubcenline
 2090 MOVE C%,36
 2100 PLOT 21,C%,1023
 2110 ENDPROC
 2120 :
 2130 DEF PROCerror
 2140 VDU26
 2150 VDU28,0,31,19,30
 2160 CLS
 2170 PRINT"An error has occuredSave scr
een (Y/N)";
 2180 REPEAT
 2190 *FX15,0
 2200 key$=GET$
 2210 UNTIL INSTR("YN",key$)>0
 2220 IF key$="N" THEN GOTO 2240
 2230 OSCLI"Save $."+STR$(M%)+".Emergenc
y 3000 8000"
 2240 VDU26
 2250 CLS
 2260 PRINT'''
 2270 REPORT:PRINT;" at line ";ERL
 2280 OSCLI "KEY 0 LIST "+STR$(ERL)+"|M"
 2290 *FX138,0,128
 2300 END
```

Listing 5

```
   10 REM Picpac Listing 11
   20 REM Copying Routine
   30 REM by James Richards
   40 REM for B/B+/M/C/E with ADFS
   50 REM (c) BBC Acorn User December 19
90
   60 :
   70 ON ERROR PROCerror
   80 PROCinit
   90 REPEAT
  100 PROCgetbox
  110 :
  120 ox%=x%
  130 oy%=y%
  140 oxr%=xr%
  150 oyr%=yr%
  160 x%=x% DIV 32
  170 y%=32-(y% DIV 32)
  180 xr%=xr% DIV 32
  190 yr%=(yr% DIV 32)-1
  200 x1%=x%+xr%
  210 y1%=y%+yr%
  220 :
  230 startx%=blocklen%*x%
  240 endx%=blocklen%*x1%
  250 starty%=screenstart%+(sw%*y%)
  260 endy%=screenstart%+(sw%*y1%)
  270 :
  280 VDU7
  290 :
  300 PROCgettarget
  310 :
  320 ox%=x%
  330 oy%=y%
  340 oxr%=xr%
  350 oyr%=yr%
  360 x%=x% DIV 32
  370 y%=32-(y% DIV 32)
  380 across1%=x%*blocklen%
  390 down1%=screenstart%+(sw%*y%)
  400 orig%=across1%
  410 :
  420 VDU7
  430 PROCcopy
  440 UNTIL FALSE
  450 :
  460 DEF PROCcopy
  470 FOR down%=starty% TO endy% STEP sw
%
  480 FOR across%=startx% TO endx%-1 STE
P 4
  490 !(across1%+down1%)=!(across%+down%
)
  500 IF INKEY(-113) THEN PROCend
  510 across1%=across1%+4
  520 NEXT across%
  530 down1%=down1%+sw%
  540 across1%=orig%
  550 NEXT down%
  560 ENDPROC
  570 :
  580 DEF PROCgetbox
  590 x%=ox%
  600 y%=oy%
  610 xr%=oxr%
  620 yr%=oyr%
  630 REPEAT
  640 IF INKEY(-113) THEN PROCend
  650 IF INKEY(-1) THEN PROCradius:GOTO7
00
  660 IF INKEY(-98) THEN x%=x%-32
  670 IF INKEY(-67) THEN x%=x%+32
  680 IF INKEY(-73) THEN y%=y%+32
  690 IF INKEY(-105) THEN y%=y%-32
  700 IF xr%<32 THEN xr%=32
  710 IF yr%<32 THEN yr%=32
  720 IF x%<0 THEN x%=0
  730 IF (x%+xr%)>1280 THEN x%=1280-xr%
  740 IF (y%-yr%)<32 THEN y%=yr%+32
  750 IF y%>1024 THEN y%=1024
  760 PROCbox
  770 PROCbox
  780 UNTIL INKEY(-99)
  790 ENDPROC
  800 :
  810 DEF PROCradius
  820 IF INKEY(-98) THEN xr%=xr%-32
  830 IF INKEY(-67) THEN xr%=xr%+32
  840 IF INKEY(-73) THEN yr%=yr%-32
  850 IF INKEY(-105) THEN yr%=yr%+32
  860 ENDPROC
  870 :
  880 DEF PROCgettarget
  890 x%=ox%
  900 y%=oy%
  910 xr%=oxr%
  920 yr%=oyr%
  930 REPEAT
  940 IF INKEY(-113) THEN PROCend
  950 IF INKEY(-98) THEN x%=x%-32
  960 IF INKEY(-67) THEN x%=x%+32
  970 IF INKEY(-105) THEN y%=y%-32
  980 IF INKEY(-73) THEN y%=y%+32
  990 IF xr%<32 THEN xr%=32
```

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PICPAC

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```
1000 IF yr%<32 THEN yr%=32
1010 IF x%<0 THEN x%=0
1020 IF (x%+xr%)>1280 THEN x%=1280-xr%
1030 IF (y%-yr%)<32 THEN y%=yr%+32
1040 IF y%>1024 THEN y%=1024
1050 PROCbox
1060 PROCbox
1070 UNTIL INKEY(-74)
1080 ENDPROC
1090 :
1100 DEF PROCbox
1110 GCOL3,1
1120 MOVE x%,y%
1130 DRAW x%+xr%,y%
1140 DRAW x%+xr%,y%-yr%
1150 DRAW x%,y%-yr%
1160 DRAW x%,y%
1170 ENDPROC
1180 :
1190 DEF PROCdelay(t%)
1200 NOW=TIME
1210 REPEAT UNTIL TIME-NOW>t%
1220 ENDPROC
1230 :
1240 DEF PROCinit
1250 *FX229,1
1260 ox%=15*32
1270 oy%=15*32
1280 oxr%=32
1290 oyr%=32
 1300 IF M%<3 THEN sw%=&280:screenstart%
=&3000:blocklen%=&10
 1310 IF M%>3 THEN sw%=&140:screenstart%
=&5800:blocklen%=&8
 1320 ENDPROC
 1330 :
 1340 DEF PROCend
 1350 CHAIN"Bootstr"
 1360 :
 1370 DEF PROCerror
 1380 VDU6
 1390 VDU28,0,31,19,30
 1400 PRINT"An error has occuredSave scr
een (Y/N)";
 1410 REPEAT
 1420 *FX15,0
 1430 key$=GET$
 1440 UNTIL INSTR("YN",key$)>0
 1450 IF key$="N" THEN GOTO 1470
 1460 OSCLI "Save $."+STR$(M%)+".Emergen
cy 3000 8000"
 1470 VDU26
 1480 CLS
 1490 PRINT'''
 1500 REPORT:PRINT;" at line ";ERL
 1510 OSCLI "KEY 0 LIST "+STR$(ERL)+"|M"
 1520 *FX 138,0,128
 1530 END
```

MOZART DICE

Listing 1

```
"1b1" []  "1b2" []  "1b3" []  "1b4" []
"1b5" []  "1b6" []  "1b7" []  "1b8" []
"1be" []  "1t1" []  "1t2" []  "1t3" []
"1t4" []  "1t5" []  "1t6" []  "1t7" []
"1t8" []  "1te" []  "2b1" []  "2b2" []
"2b3" []  "2b4" []  "2b5" []  "2b6" []
"2b7" []  "2b8" []  "2be" []  "2t1" []
"2t2" []  "2t3" []  "2t4" []  "2t5" []
"2t6" []  "2t7" []  "2t8" []  "2te" []
"3b1" []  "3b2" []  "3b3" []  "3b4" []
"3b5" []  "3b6" []  "3b7" []  "3b8" []
"3be" []  "3t1" []  "3t2" []  "3t3" []
"3t4" []  "3t5" []  "3t6" []  "3t7" []
"3t8" []  "3te" []  "4b1" []  "4b2" []
"4b3" []  "4b4" []  "4b5" []  "4b6" []
"4b7" []  "4b8" []  "4be" []  "4t1" []
"4t2" []  "4t3" []  "4t4" []  "4t5" []
"4t6" []  "4t7" []  "4t8" []  "4te" []
"5b1" []  "5b2" []  "5b3" []  "5b4" []
"5b5" []  "5b6" []  "5b7" []  "5b8" []
"5be" []  "5t1" []  "5t2" []  "5t3" []
"5t4" []  "5t5" []  "5t6" []  "5t7" []
"5t8" []  "5te" []  "6b1" []  "6b2" []
"6b3" []  "6b4" []  "6b5" []  "6b6" []
"6b7" []  "6b8" []  "6be" []  "6t1" []
"6t2" []  "6t3" []  "6t4" []  "6t5" []
"6t6" []  "6t7" []  "6t8" []  "6te" []
"tb1" []  "tb2" []  "tb3" []  "tb4" []
"tb5" []  "tb6" []  "tb7" []  "tb8" []
"tbe" []  "mix" []  "cls" []
"info" []  "info2" []  "part1" []
"press" []  "rand" []  "RUN" []

"1b1" [%STAFF
SCORE
0:24,CGeGcGeG||
]

"1b2" [%STAFF
0:24,DGfGcGeG||
]

"1b3" [%STAFF
0:24,CAfAcGeG||
]

"1b4" [%STAFF
-1:24,BGdGcGeG||
]

"1b5" [%STAFF
0:48,F^^f(C)||
]

"1b6" [%STAFF
-1:48,E(C)^(^)^E(C)||
]

"1b7" [%STAFF
-1:48,D(C)^(^)^D(B)||
]

"1b8" [%STAFF
-1:48,C(!C)^(^)^C(E)||
]

"1be" [%STAFF
-1:48,GCc^||
]

"1t1" [%STAFF
SCORE
1:48,C/EG||
]

"1t2" [%STAFF
0:12,B/////CDc///////||
]

"1t3" [%STAFF
1:48,A/gC||
]

"1t4" [%STAFF
1:12,G///8,fGf12,eFe///////||
]

"1t5" [%STAFF
0:12,A/BCDEFGAgfedcba||
]

"1t6" [%STAFF
0:12,G/ABCDEFGfedcbag||
]

"1t7" [%STAFF
0:12,F/GABCDEFedcbagf||
]

"1t8" [%STAFF
0:12,E/FGABCDEdcbagfe||
]

"1te" [%STAFF
0:48,GCc^||
]

"2b1" [%STAFF
SCORE
0:24,C//gC//g||
]

"2b2" [%STAFF
0:24,CgCEG///||
]

"2b3" [%STAFF
0:24,F//dF//d||
]

"2b4" [%STAFF
0:24,FdbDg///||
]

"2b5" [%STAFF
0:24,C(E)C(E)C(E)C(E)C(E)C(E)C(E)
0:24,C(E)||
]

"2b6" [%STAFF
0:24,D(F)D(F)D(F)D(F)D(F)D(F)D(F)
0:24,D(F)||
]

"2b7" [%STAFF
0:24,C(E)C(E)C(E)C(E)C(E)C(E)C(E)
0:24,C(E)||
]

"2b8" [%STAFF
0:24,D(F)D(F)D(F)D(F)D(F)D(F)D(F)
0:24,D(F)||
]

"2be" [%STAFF
-1:48,C^^/||
]

"2t1" [%STAFF
SCORE
1:24,C//gC//g||
]

"2t2" [%STAFF
1:24,CgCEG///||
]

"2t3" [%STAFF
1:24,F//dF//d||
]

"2t4" [%STAFF
1:24,FdbDg///||
]

"2t5" [%STAFF
1:24,C^C//Edc||
]

"2t6" [%STAFF
1:24,Cbb//DFb||
]

"2t7" [%STAFF
1:24,Dcc//Edc||
]

"2t8" [%STAFF
1:24,Cbb//DFb||
]

"2te" [%STAFF
1:48,C^^/||
]

"3b1" [%STAFF
SCORE
-1:24,CGeGcGeG||
]

"3b2" [%STAFF
-1:24,DGfGcGeG||
]

"3b3" [%STAFF
-2:24,BGdGcGeG||
]

"3b4" [%STAFF
-2:24,G!Cbagfed||
]

"3b5" [%STAFF
-1:24,CGeGcGeG||
]

"3b6" [%STAFF
-1:24,DGfGcGeG||
]

"3b7" [%STAFF
-2:24,FDaDg(B)///||
]

"3b8" [%STAFF
-1:24,CGeGc///||
]

"3be" [%STAFF
-1:48,E/C^||
]

"3t1" [%STAFF
SCORE
1:48,GGGG||
]

"3t2" [%STAFF
0:12,B///B///C///DcbC||
]

"3t3" [%STAFF
1:48,FFee||
]

"3t4" [%STAFF
1:192,D||
]

"3t5" [%STAFF
1:48,GGGG||
]

"3t6" [%STAFF
0:48,BBCC||
]

"3t7" [%STAFF
1:24,D/D/g/AB||
]

"3t8" [%STAFF
1:24,C///^gCE||
]

"3te" [%STAFF
1:48,D/c^||
]

"4b1" [%STAFF
SCORE
-1:48,A(C)E(^)a(C)E(^)||
]

"4b2" [%STAFF
-1:48,A(C)E(^)a(C)E(^)||
]

"4b3" [%STAFF
-1:48,A(C)E(^)a(C)E(^)||
]

"4b4" [%STAFF
-1:48,AFdF||
]

"4b5" [%STAFF
-1:48,AFdF||
]

"4b6" [%STAFF
-1:48,+GEbE||
]

"4b7" [%STAFF
-1:48,+GEbE||
]

"4b8" [%STAFF
-1:48,AEcE||
]

"4be" [%STAFF
-1:48,Gc/^||
]

"4t1" [%STAFF
SCORE
1:24,E/Fee/Fe||
]

"4t2" [%STAFF
1:24,E/C///Cb||
]

"4t3" [%STAFF
1:24,A/Agf/fe||
]

"4t4" [%STAFF
1:24,D/D///Ed||
]

"4t5" [%STAFF
1:24,D/Edd/Ed||
]

"4t6" [%STAFF
1:24,D/B///Ba||
]

"4t7" [%STAFF
1:24,+G/+Gfe/ed||
]

"4t8" [%STAFF
1:48,CC^^||
]

"4te" [%STAFF
0:48,BC/^||
]

"5b1" [%STAFF
SCORE
-1:24,CGeG+dE+dE||
]

"5b2" [%STAFF
```

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```
-1:24,Fedcc/^/||
]

"5b3" [%STAFF
-1:24,CGeGbFdF||
]

"5b4" [%STAFF
-1:24,CGeGg/^/||
]

"5b5" [%STAFF
-1:24,CGeG+dE+dE||
]

"5b6" [%STAFF
-1:24,Fedcc/^/||
]

"5b7" [%STAFF
-1:24,CGeGbFdF||
]

"5b8" [%STAFF
-2:48,CGC^||
]

"5be" [%STAFF
-1:48,GbC^||
]

"5t1" [%STAFF
SCORE
Ø:24,G///+fG+fG||
]

"5t2" [%STAFF
Ø:12,A/g/f/e/e///G//e||
]

"5t3" [%STAFF
Ø:24,C^C^g^g||
]

"5t4" [%STAFF
Ø:12,C/////DEd/E/F/+F/||
]

"5t5" [%STAFF
Ø:24,G///+fG+fG||
]

"5t6" [%STAFF
Ø:12,A/g/f/e/e///G//e||
]

"5t7" [%STAFF
Ø:24,C^C^g^g||
]

"5t8" [%STAFF
-1:24,F///eGCE||
]

"5te" [%STAFF
Ø:12,B/////CDc///^///||
]

"6b1" [%STAFF
SCORE
Ø:24,CE(G)E(G)E(G)c(^)E(G)E(G)E(G)||
]

"6b2" [%STAFF
Ø:24,CE(G)E(G)E(G)c(^)E(G)E(G)E(G)||
]

"6b3" [%STAFF
-1:24,BF(G)F(G)F(G)b(^)F(G)F(G)F(G)||
]

"6b4" [%STAFF
-1:24,GD(F)D(F)D(F)g(^)D(F)D(F)D(F)||
]
"6b5" [%STAFF
-1:24,GD(F)D(F)D(F)g(^)D(F)D(F)D(F)||
]

"6b6" [%STAFF
Ø:24,CE(G)E(G)E(G)c(^)E(G)E(G)E(G)||
]

"6b7" [%STAFF
-1:24,CE(-B)E(-B)E(-B)c(^)E(-B)
-1:24,E(-B)E(-B)||
]

"6b8" [%STAFF
-1:24,FA(C)A(C)A(C)f(^)A(C)A(C)A(C)||
]

"6be" [%STAFF
-1:48,Cc^^||
]

"6t1" [%STAFF
SCORE
1:12,C///~C//gE///~E//c||
]

"6t2" [%STAFF
1:12,G//////////fedc||
]

"6t3" [%STAFF
1:48,+CD/^||
]

"6t4" [%STAFF
Ø:48,G/BD||
]

"6t5" [%STAFF
1:24,F///-FAgf||
]

"6t6" [%STAFF
1:24,+DEE/^///||
]

"6t7" [%STAFF
1:24,G///!e//e||
]

"6t8" [%STAFF
Ø:24,Gff/^///||
]

"6te" [%STAFF
1:48,C!C^^||
]

"RUN" [RAND RAND!
"1"PLAY
info
]

"cls" [26 #OUT 12 #OUT
]

"info" [cls DISPLAY
%                AmaDIEus
%                   by
%      Ian Waugh (& Wolfgang Mozart)
%
%This program was 'inspired' by the
%composition system rumoured to have
%been devised by Mozart (although some
%music authorities think the system was
%not his). The system requires a table
%of individual bars to be composed - say
%in a grid 8 x 6. Bars are chosen for
%placement in the composition by the
%roll of a die.
press
info2
]

"info2" [cls DISPLAY
%  This program contains the first eight
%bars of six well-known Mozart pieces.
%It selects the playing order at random
%although bar one of all the pieces will
%only play at the beginning of a phrase,
%bar two of a piece will only play as
%the second bar and so on.
%   A single bar consists of a treble
%part - "tn" - and a bass part - "bn"
%where n is the tune number. You can
%make each 8-bar tune play by giving the
%"rand" word the value of 1, 2, 3...6.
%   Redefine the "tn" and "bn" words to
%produce other random compositions.
%                              Ian Waugh
]

"mix" [M5MIX 48,142=T
1 SHARE 2 VOICES Upright
 1 VOICE 128 VOL -1 PAN
 2 VOICE 128 VOL -1 PAN
2 SHARE 1 VOICES Upright
 1 VOICE 128 VOL 1 PAN
PNUM SHARE
]

"part1" [8 FOR(   %
rand tb1
rand tb2
rand tb3
rand tb4
rand tb5
rand tb6
rand tb7
1 INDEX #= IF( rand tbe )ELSE( %End bar
 1 RANDL IF( rand tb8 )ELSE(
  rand tbe )IF
   )IF
)FOR
]

"press" [NL 132 #OUT 157 #OUT 135 #OUT
                % New Blue background
1Ø FOR( SP )FOR % Spaces to center text
"Press RETURN" $OUT
$IN  $2          % Wait for keypress
]

"rand" [5 RANDL 1 #+
]

"tb1" [#11 1#= IF( 2P( 1t1 )P 1b1 )IF
#11 2#= IF( 2P( 2t1 )P 2b1 )IF
#11 3#= IF( 2P( 3t1 )P 3b1 )IF
#11 4#= IF( 2P( 4t1 )P 4b1 )IF
#11 5#= IF( 2P( 5t1 )P 5b1 )IF
#11 6#= IF( 2P( 6t1 )P 6b1 )IF
#2
]

"tb2" [#11 1#= IF( 2P( 1t2 )P 1b2 )IF
#11 2#= IF( 2P( 2t2 )P 2b2 )IF
#11 3#= IF( 2P( 3t2 )P 3b2 )IF
#11 4#= IF( 2P( 4t2 )P 4b2 )IF
#11 5#= IF( 2P( 5t2 )P 5b2 )IF
#11 6#= IF( 2P( 6t2 )P 6b2 )IF
#2
]

"tb3" [#11 1#= IF( 2P( 1t3 )P 1b3 )IF
#11 2#= IF( 2P( 2t3 )P 2b3 )IF
#11 3#= IF( 2P( 3t3 )P 3b3 )IF
#11 4#= IF( 2P( 4t3 )P 4b3 )IF
#11 5#= IF( 2P( 5t3 )P 5b3 )IF
#11 6#= IF( 2P( 6t3 )P 6b3 )IF
#2
]

"tb4" [#11 1#= IF( 2P( 1t4 )P 1b4 )IF
#11 2#= IF( 2P( 2t4 )P 2b4 )IF
#11 3#= IF( 2P( 3t4 )P 3b4 )IF
#11 4#= IF( 2P( 4t4 )P 4b4 )IF
#11 5#= IF( 2P( 5t4 )P 5b4 )IF
#11 6#= IF( 2P( 6t4 )P 6b4 )IF
#2
]

"tb5" [#11 1#= IF( 2P( 1t5 )P 1b5 )IF
#11 2#= IF( 2P( 2t5 )P 2b5 )IF
#11 3#= IF( 2P( 3t5 )P 3b5 )IF
#11 4#= IF( 2P( 4t5 )P 4b5 )IF
#11 5#= IF( 2P( 5t5 )P 5b5 )IF
#11 6#= IF( 2P( 6t5 )P 6b5 )IF
#2
]

"tb6" [#11 1#= IF( 2P( 1t6 )P 1b6 )IF
#11 2#= IF( 2P( 2t6 )P 2b6 )IF
#11 3#= IF( 2P( 3t6 )P 3b6 )IF
#11 4#= IF( 2P( 4t6 )P 4b6 )IF
#11 5#= IF( 2P( 5t6 )P 5b6 )IF
#11 6#= IF( 2P( 6t6 )P 6b6 )IF
#2
]

"tb7" [#11 1#= IF( 2P( 1t7 )P 1b7 )IF
#11 2#= IF( 2P( 2t7 )P 2b7 )IF
#11 3#= IF( 2P( 3t7 )P 3b7 )IF
#11 4#= IF( 2P( 4t7 )P 4b7 )IF
#11 5#= IF( 2P( 5t7 )P 5b7 )IF
#11 6#= IF( 2P( 6t7 )P 6b7 )IF
#2
]

"tb8" [#11 1#= IF( 2P( 1t8 )P 1b8 )IF
#11 2#= IF( 2P( 2t8 )P 2b8 )IF
#11 3#= IF( 2P( 3t8 )P 3b8 )IF
#11 4#= IF( 2P( 4t8 )P 4b8 )IF
#11 5#= IF( 2P( 5t8 )P 5b8 )IF
#11 6#= IF( 2P( 6t8 )P 6b8 )IF
#2
]

"tbe" [#11 1#= IF( 2P( 1te )P 1be )IF
#11 2#= IF( 2P( 2te )P 2be )IF
#11 3#= IF( 2P( 3te )P 3be )IF
#11 4#= IF( 2P( 4te )P 4be )IF
#11 5#= IF( 2P( 5te )P 5be )IF
#11 6#= IF( 2P( 6te )P 6be )IF
#2
]
```

ADDRESS BOOK

Listing 1

```
   10 REM >ABS - Address Book Source
   20 REM By David Lawrence
   30 REM For Archimedes Only
   40 REM (c) BAU December 1990
   50 :
   60 PROCinit
   70 PROCvase
   80 PROCassemble
   90 SYS "OS_File",10,"%.AB",&FFA,,code
%,0%
  100 *AB
  110 PRINT"Address book installed"
  120 END
  130 :
  140 DEF PROCinit
  150 DIM code% 10000
  160 cur  = 5
  170 pos  = 6
  180 len  = 7
  190 max  = 8
  200 wp   = 12
  210 sp   = 13
  220 link = 14
  230 pc   = 15
  240 R0=0:R1=1:R2=2:R3=3:R4=4:R5=5:R6=6
:R7=7:R8=8:R9=9
  250 R10=10:R11=11:R12=12:R13=13:R14=14
:R15=15
  260 wpaddr = 0
  270 fields = 12
  280 addrlines = 7
  290 fieldsize = 64
  300 ENDPROC
  310 :
  320 DEF PROCvase
  330 editarea = FNalloc(fields * fields
ize)
  340 surname  = editarea
  350 forename = editarea + fieldsize
  360 oldcurs  = FNalloc(4)
  370 xpos     = FNalloc(4)
  380 ypos     = FNalloc(4)
  390 namelist = FNalloc(4)
  400 handle   = FNalloc(4)
  410 number   = FNalloc(16)
  420 labtab   = FNalloc(4)
  430 ptraddr  = FNalloc(4)
  440 entaddr  = FNalloc(4)
  450 filename = FNalloc(256)
  460 default  = FNalloc(256)
  470 ENDPROC
  480 :
  490 DEF PROCassemble
  500 FOR pass=4 TO 6 STEP 2:P%=0:O%=cod
e%
  510 [OPT pass
  520 EQUD 0
  530 EQUD init
  540 EQUD 0
  550 EQUD 0
  560 EQUD titlestring
  570 EQUD helpstring
  580 EQUD helptable
  590 EQUD 0
  600 EQUD 0
  610 EQUD 0
  620 EQUD 0
  630 :
  640 .titlestring
  650 EQUS "AddressBook"
  660 EQUB 0
  670 :
  680 .helpstring
  690 EQUS "Address Book"
  700 EQUB 9
  710 EQUS "1.00 ("
  720 EQUS MID$(TIME$,5,11)
  730 EQUS ")"
  740 EQUB 0
  750 :
  760 .helptable
  770 FNcom("AddName",0,0,addname,edit_s
,edit_h)
  780 FNcom("DeleteName",1,255,delname,d
el_s,del_h)
  790 FNcom("EditName",1,255,editname,ed
t_s,edt_h)
  800 FNcom("Phone",1,255,phone,phn_s,ph
n_h)
  810 FNcom("Address",1,255,address,adr_
s,adr_h)
  820 FNcom("Label",1,244,label,lab_s,la
b_h)
  830 FNcom("NewBook",1,1,newbook,new_s,
new h)
```

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```
 840 FNcom("SaveBook",0,1,savebook,sav_
s,sav_h)
 850 FNcom("LoadBook",1,1,loadbook,loa_
s,loa_h)
 860 FNcom("BookInfo",0,0,bookinfo,siz_
s,siz_h)
 870 FNcom("ListAll",0,1,listall,all_s,
all_h)
 880 EQUB 0
 890 ALIGN
 900 :
 910 FNhelp(edit_h,"*AddName adds a new
 entry to the address book.",13)
 920 FNhelp(edit_s,"Syntax: *AddName",0
)
 930
 940 FNhelp(del_h,"*DeleteName deletes
an entry from the address book.",13)
 950 FNhelp(del_s,"Syntax: *DeleteName
<quickref> | [<forename(s)>] <surname>",
0)
 960
 970 FNhelp(edt_h,"*EditName allows the
 details of a named entry to be altered.
",13)
 980 FNhelp(edt_s,"Syntax: *EditName <q
uickref> | [<forename(s)>] <surname>",0)
 990
 1000 FNhelp(phn_h,"*Phone displays the
phone number for a given name.",13)
 1010 FNhelp(phn_s,"Syntax: *Phone <quic
kref> | [<forename(s)>] <surname>",0)
 1020
 1030 FNhelp(adr_h,"*Address displays th
e address for a given name.",13)
 1040 FNhelp(adr_s,"Syntax: *Address <qu
ickref> | [<forename(s)>] <surname>",0)
 1050
 1060 FNhelp(lab_h,"*Label displays the
full name and address in a form suitable
 for label printing. An optional tab pos
ition can also be specified.",13)
 1070 FNhelp(lab_s,"Syntax: *Label [tab]
 <quickref> | [<forename(s)>] <surname>"
,0)
 1080
 1090 FNhelp(new_h,"*NewBook clears all
entries in the current address book and
sets up a name for a new file.",13)
 1100 FNhelp(new_s,"Syntax: *NewBook <fi
lename>",0)
 1110
 1120 FNhelp(sav_h,"*SaveBook saves all
entries in current address book.",13)
 1130 FNhelp(sav_s,"Syntax: *SaveBook [<
filename>]",0)
 1140
 1150 FNhelp(loa_h,"*LoadBook loads a ne
w address book.",13)
 1160 FNhelp(loa_s,"Syntax: *LoadBook <f
ilename>",0)
 1170
 1180 FNhelp(siz_h,"*BookInfo displays i
nformation about the current address boo
k.",13)
 1190 FNhelp(siz_s,"Syntax: *BookInfo",0
)
 1200
 1210 FNhelp(all_h,"*ListAll displays al
l the entries whose surname match the ab
breviation given (not necessarily list i
n alphabetic order).",13)
 1220 FNhelp(all_s,"Syntax: *ListAll [<a
bbreviation>]",0)
 1230 ALIGN
 1240 :
 1250 .init
 1260 STMFD (sp)!,{R7-R11,link}
 1270 MOV R0,#6
 1280 LDR R3,rmasize
 1290 SWI "OS_Module"
 1300 BVS noinit
 1310 STR R2,[wp]
 1320 MOV wp,R2
 1330 MOV R0,#0
 1340 FNstr(R0,namelist)
 1350 ADR R0,defname
 1360 BL initfile
 1370 FNadr(R0,default)
 1380 BL setfile
 1390 BL load
 1400 .noinit
 1410 LDMFD (sp)!,{R7-R11,pc}
 1420 :
 1430 .initfile
 1440 STMFD (sp)!,{R0-R2,link}
 1450 FNadr(R1,default)
 1460 .copyfile
 1470 LDRB R2,[R0],#1
 1480 CMP R2,#13
 1490 MOVEQS R2,#0
 1500 STRB R2,[R1],#1
 1510 BNE copyfile
 1520 LDMFD (sp)!,{R0-R2,pc}
 1530 :
 1540 .setfile
 1550 STMFD (sp)!,{R0-R2,link}
 1560 FNadr(R1,filename)
 1570 .sfloop
 1580 LDRB R2,[R0],#1
 1590 STRB R2,[R1],#1
 1600 CMP R2,#0
 1610 BNE sfloop
 1620 LDMFD (sp)!,{R0-R2,pc}
 1630 :
 1640 .rmasize
 1650 EQUD wpaddr
 1660 .defname
 1670 EQUS "%.AddrBook"+CHR$13
 1680 ALIGN
 1690 :
 1700 .addname
 1710 STMFD (sp)!,{R0-R2,R12,link}
 1720 LDR wp,[wp]
 1730 MOV R0,#0
 1740 MOV R1,#fields
 1750 MOV R2,wp
 1760 .blanket
 1770 STRB R0,[R2],#fieldsize
 1780 SUBS R1,R1,#1
 1790 BNE blanket
 1800 MOV R0,#0
 1810 BL editfields
 1820 LDMFD (sp)!,{R0-R2,R12,pc}
 1830 :
 1840 .editname
 1850 STMFD (sp)!,{R0-R2,R9,R12,link}
 1860 LDR wp,[wp]
 1870 BL splitname
 1880 BL findentry
 1890 BEQ noedit
 1900 LDR R2,[R0]
 1910 LDR R1,[R2]
 1920 STR R1,[R0]
 1930 FNstr(R0,ptraddr)
 1940 FNstr(R2,entaddr)
 1950 MOV R0,R2
 1960 BL expand
 1970 SWI "OS_RemoveCursors"
 1980 MOV R1,#fields-1
 1990 .leavespace
 2000 SWI 256+10
 2010 SUBS R1,R1,#1
 2020 BNE leavespace
 2030 MOV R2,#fields-1
 2040 .showem
 2050 MOV R1,R2
 2060 BL namefield
 2070 ADD R0,wp,R1,ASL #6
 2080 LDRB R1,[R0],#1
 2090 SWI "OS_WriteN"
 2100 SWI 256+13
 2110 SUBS R2,R2,#1
 2120 SWIPL 256+11
 2130 BPL showem
 2140 SWI "OS_RestoreCursors"
 2150 MOV R0,#fields-1
 2160 BL editfields
 2170 BEQ wasret
 2180 FNldr(R0,ptraddr)
 2190 FNldr(R2,entaddr)
 2200 STR R2,[R0]
 2210 B noedit
 2220 .wasret
 2230 MOV R0,#7
 2240 FNldr(R2,entaddr)
 2250 SWI "OS_Module"
 2260 .noedit
 2270 LDMFD (sp)!,{R0-R2,R9,R12,pc}
 2280 :
 2290 .delname
 2300 STMFD (sp)!,{R0-R2,R12,link}
 2310 LDR wp,[wp]
 2320 BL splitname
 2330 BL findentry
 2340 BEQ nodelete
 2350 LDR R2,[R0]
 2360 LDR R1,[R2]
 2370 STR R1,[R0]
 2380 MOV R0,#7
 2390 SWI "OS_Module"
 2400 .nodelete
 2410 LDMFD (sp)!,{R0-R2,R12,pc}
 2420 :
 2430 .newbook
 2440 STMFD (sp)!,{R12,link}
 2450 LDR wp,[wp]
 2460 BL initfile
 2470 BL clearbook
 2480 LDMFD (sp)!,{R12,pc}
 2490 :
 2500 .clearbook
 2510 STMFD (sp)!,{R0-R2,link}
 2520 FNadr(R1,namelist)
 2530 LDR R2,[R1]
 2540 .freelist
 2550 CMP R2,#0
 2560 BEQ allgorn
 2570 LDR R1,[R2]
 2580 MOV R0,#7
 2590 SWI "OS_Module"
 2600 MOVS R2,R1
 2610 BNE freelist
 2620 .allgorn
 2630 MOV R0,#0
 2640 FNstr(R0,namelist)
 2650 LDMFD (sp)!,{R0-R2,pc}
 2660 :
 2670 .savebook
 2680 STMFD (sp)!,{R0-R9,R12,link}
 2690 LDR wp,[wp]
 2700 CMP R1,#0
 2710 ADDEQ R0,wp,#default
 2720 BL setfile
 2730 FNadr(R9,namelist)
 2740 LDR R0,[R9]
 2750 CMP R0,#0
 2760 BEQ nodata
 2770 MOV R0,#&80
 2780 FNadr(R1,filename)
 2790 SWI "OS_Find"
 2800 FNstr(R0,handle)
 2810 .saveloop
 2820 LDR R1,[R9]
 2830 MOVS R9,R1
 2840 BEQ saved
 2850 ADD R1,R1,#4
 2860 MOV R2,#fields
 2870 .findend
 2880 LDRB R0,[R1],#1
 2890 CMP R0,#0
 2900 BNE findend
 2910 SUBS R2,R2,#1
 2920 BNE findend
 2930 ADD R2,R9,#4
 2940 SUB R3,R1,R2
 2950 FNldr(R1,handle)
 2960 MOV R0,#2
 2970 SWI "OS_GBPB"
 2980 MOV R0,#10
 2990 SWI "OS_BPut"
 3000 B saveloop
 3010 .saved
 3020 MOV R0,#0
 3030 FNldr(R1,handle)
 3040 SWI "OS_Find"
 3050 .exitsave
 3060 LDMFD (sp)!,{R0-R9,R12,pc}
 3070 :
 3080 .nodata
 3090 LDMFD (sp)!,{R0-R9,R12,link}
 3100 ADR R0,nodataerr
 3110 ORRS pc,link,#(1<<28)
 3120 .nodataerr
 3130 EQUD 257
 3140 EQUS "No data in address book"+CHR
$0
 3150 ALIGN
 3160 :
 3170 .loadbook
 3180 STMFD (sp)!,{R0-R9,R12,link}
 3190 LDR wp,[wp]
 3200 BL initfile
 3210 FNadr(R0,default)
 3220 BL setfile
 3230 BL clearbook
 3240 BL load
 3250 CMP R0,#0
 3260 STRNE R0,[sp]
 3270 LDMFD (sp)!,{R0-R9,R12,link}
 3280 MOVEQ pc,link
 3290 ORRS pc,link,#(1<<28)
 3300 :
 3310 .load
 3320 STMFD (sp)!,{R1-R3,R9,link}
 3330 MOV R0,#&40
 3340 FNadr(R1,filename)
 3350 SWI "OS_Find"
 3360 MOVS R1,R0
 3370 ADREQ R0,fnferr
 3380 BEQ exitload
 3390 FNadr(R9,namelist)
 3400 .loadentry
 3410 MOV R2,#0
 3420 MOV R3,#fields
 3430 .loadloop
 3440 SWI "OS_BGet"
 3450 BCS endoffile
 3460 STRB R0,[wp,R2]
 3470 CMP R0,#0
 3480 SUBEQ R3,R3,#1
 3490 ADD R2,R2,#1
 3500 CMP R0,#10
 3510 BNE loadloop
 3520 CMP R3,#0
 3530 MOVNE R2,#1
 3540 BNE endoffile
 3550 MOV R0,#6
 3560 ADD R3,R2,#4
 3570 SWI "XOS_Module"
 3580 ADRVS R0,outofrma
 3590 BVS exitload
 3600 STR R2,[R9]
 3610 MOV R9,R2
 3620 MOV R0,#0
 3630 STR R0,[R2],#4
 3640 MOV R3,wp
 3650 .recopy
 3660 LDRB R0,[R3],#1
 3670 CMP R0,#10
 3680 STRNEB R0,[R2],#1
 3690 BNE recopy
 3700 B loadentry
 3710 .endoffile
 3720 MOV R0,#0
 3730 SWI "OS_Find"
 3740 CMP R2,#0
 3750 MOVEQ R0,#0
 3760 BEQ exitload
 3770 ADR R0,badfile
 3780 .exitload
 3790 LDMFD (sp)!,{R1-R3,R9,pc}
 3800 :
 3810 .fnferr
 3820 EQUD 214
 3830 EQUS "File not found"+CHR$0
 3840 ALIGN
 3850 :
 3860 .outofrma
 3870 EQUD 257
 3880 EQUS "Not enough RMA to load whole
file"+CHR$0
 3890 ALIGN
 3900 :
 3910 .badfile
 3920 EQUD 0
 3930 EQUS "Bad file format"+CHR$0
 3940 ALIGN
 3950 :
 3960 .editfields
 3970 STMFD (sp)!,{R0-R9,link}
 3980 MOV max,R0
 3990 MOV R0,#237
 4000 MOV R1,#0
 4010 MOV R2,#255
 4020 SWI "OS_Byte"
 4030 FNstr(R1,oldcurs)
 4040 MOV R0,#4
 4050 MOV R1,#1
 4060 SWI "OS_Byte"
 4070 MOV cur,#0
 4080 MOV pos,#0
 4090 .edit_main
 4100 BL off
 4110 SWI 256+13
 4120 MOV R1,cur
 4130 BL namefield
 4140 ADD R9,wp,cur,ASL #6
 4150 LDRB len,[R9],#1
 4160 MOV R0,R9
 4170 MOV R1,len
 4180 SWI "OS_WriteN"
 4190 CMP pos,len
 4200 MOVGT pos,len
 4210 ADD R0,pos,#11
 4220 FNstr(R0,xpos)
 4230 BL on
 4240 .edit_loop
 4250 SWI "OS_ReadC"
 4260 CMP R0,#27
 4270 BEQ escape
 4280 CMP R0,#13
 4290 BEQ return
 4300 CMP R0,#127
 4310 BEQ deletel
 4320 CMP R0,#135
 4330 BEQ deleter
 4340 CMP R0,#136
 4350 BEQ cursleft
 4360 CMP R0,#137
 4370 BEQ cursright
 4380 CMP R0,#138
 4390 BEQ cursdown
 4400 CMP R0,#139
 4410 BEQ cursup
 4420 CMP R0,#32
 4430 BLT edit_loop
 4440 CMP R0,#127
 4450 BGT edit_loop
 4460 CMP len,#fieldsize-1
 4470 BEQ edit_loop
 4480 BL off
 4490 ADD R2,R9,pos
 4500 SUB R3,len,pos
 4510 .ins_loop
 4520 LDRB R1,[R2]
 4530 STRB R0,[R2],#1
 4540 SWI "OS_WriteC"
 4550 MOV R0,R1
 4560 SUBS R3,R3,#1
 4570 BPL ins_loop
 4580 BL on
 4590 ADD pos,pos,#1
 4600 ADD len,len,#1
 4610 SWI 256+9
 4620 B edit_loop
 4630 :
 4640 .cursleft
 4650 CMP pos,#0
 4660 SUBNE pos,pos,#1
 4670 SWINE 256+8
 4680 B edit_loop
 4690 :
 4700 .cursright
 4710 CMP pos,len
 4720 ADDNE pos,pos,#1
 4730 SWINE 256+9
 4740 B edit_loop
 4750 :
 4760 .deletel
 4770 CMP pos,#0
 4780 BEQ edit_loop
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ADDRESS BOOK

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```
4790 BL off
4800 SWI 256+8
4810 ADD R2,R9,pos
4820 SUB R3,len,pos
4830 .dell_loop
4840 SUBS R3,R3,#1
4850 BMI no_dell
4860 LDRB R0,[R2],#-1
4870 STRB R0,[R2],#2
4880 SWI "OS_WriteC"
4890 B dell_loop
4900 .no_dell
4910 SWI 256+32
4920 BL on
4930 SWI 256+8
4940 SUB pos,pos,#1
4950 SUB len,len,#1
4960 B edit_loop
4970 :
4980 .deleter
4990 CMP pos,len
5000 BEQ edit_loop
5010 BL off
5020 ADD R2,R9,pos
5030 SUB R3,len,pos
5040 .delr_loop
5050 SUBS R3,R3,#1
5060 BEQ no_delr
5070 LDRB R0,[R2,#1]
5080 STRB R0,[R2],#1
5090 SWI "OS_WriteC"
5100 B delr_loop
5110 .no_delr
5120 SWI 256+32
5130 BL on
5140 SUB len,len,#1
5150 B edit_loop
5160 :
5170 .cursdown
5180 CMP cur,max
5190 BEQ edit_loop
5200 BL savelen
5210 ADD cur,cur,#1
5220 SWI 256+10
5230 B edit_main
5240 :
5250 .cursup
5260 CMP cur,#0
5270 BEQ edit_loop
5280 BL savelen
5290 SUB cur,cur,#1
5300 SWI 256+11
5310 B edit_main
5320 :
5330 .escape
5340 BL savelen
5350 MOV R0,#126
5360 SWI "OS_Byte"
5370 MOV R0,#4
5380 FNldr(R1,oldcurs)
5390 SWI "OS_Byte"
5400 SWI 256+13
5410 .gotoend
5420 MOV R1,cur
5430 BL namefield
5440 ADD R0,wp,R1,ASL #6
5450 LDRB R1,[R0],#1
5460 SWI "OS_WriteN"
5470 SWI "OS_NewLine"
5480 ADD cur,cur,#1
5490 CMP cur,max
5500 BLE gotoend
5510 MOVS R0,#1
5520 LDMFD (sp)!,{R0-R9,pc}
5530 :
5540 .return
5550 BL savelen
5560 ADD cur,cur,#1
5570 SWI 256+13
5580 SWI 256+10
5590 MOV pos,#0
5600 CMP cur,max
5610 MOVGT max,cur
5620 CMP max,#fields
5630 BNE edit_main
5640 MOV len,#0
5650 MOV R1,#fields-1
5660 .countlen
5670 LDRB R0,[wp,R1,ASL #6]
5680 ADD len,len,R0
5690 SUBS R1,R1,#1
5700 BPL countlen
5710 CMP len,#0
5720 BEQ itsblank
5730 MOV R0,#6
5740 ADD R3,len,#fields+4
5750 SWI "XOS_Module"
5760 BVC isroom
5770 SWI 256+11
5780 SWI 256+7
5790 SUB cur,cur,#1
5800 SUB max,max,#1
5810 B edit_main
5820 .isroom
5830 MOV R9,R2
5840 MOV R0,#0
5850 STR R0,[R9],#4
5860 MOV R1,#fields-1
5870 BL copyfield
5880 MOV R1,#0
5890 .therest
5900 BL copyfield
5910 ADD R1,R1,#1
5920 CMP R1,#fields-1
5930 BNE therest
5940 ADD R10,R2,#4
5950 FNadr(R9,namelist)
5960 .findpos
5970 LDR R11,[R9]
5980 CMP R11,#0
5990 BEQ foundpos
6000 ADD R11,R11,#4
6010 LDRB R0,[R10]
6020 CMP R0,#0
6030 BEQ nextone
6040 LDRB R1,[R11]
6050 CMP R1,#0
6060 BEQ foundpos
6070 MOV R3,#0
6080 .compare
6090 LDRB R0,[R10,R3]
6100 LDRB R1,[R11,R3]
6110 ADD R3,R3,#1
6120 CMP R0,#0
6130 BEQ foundpos
6140 CMP R1,#0
6150 BEQ nextone
6160 CMP R0,R1
6170 BLT foundpos
6180 BEQ compare
6190 .nextone
6200 SUB R9,R11,#4
6210 B findpos
6220 .foundpos
6230 LDR R1,[R9]
6240 STR R2,[R9]
6250 STR R1,[R2]
6260 .itsblank
6270 MOV R0,#4
6280 FNldr(R1,oldcurs)
6290 SWI "OS_Byte"
6300 MOVS R0,#0
6310 LDMFD (sp)!,{R0-R9,pc}
6320 :
6330 .savelen
6340 SUB R1,R9,#1
6350 .findtrail
6360 LDRB R0,[R1,len]
6370 CMP R0,#32
6380 SUBEQ len,len,#1
6390 BEQ findtrail
6400 STRB len,[R9,#-1]
6410 MOV pc,link
6420 :
6430 .splitname
6440 STMFD (sp)!,{R0-R2,link}
6450 MOV R2,#0
6460 FNstr(R2,surname)
6470 FNstr(R2,forename)
6480 CMP R1,#0
6490 BEQ splat
6500 FNadr(R9,forename)
6510 .snloop
6520 LDRB R2,[R0],#1
6530 CMP R2,#32
6540 BEQ snloop
6550 SUBS R0,R0,#1
6560 CMP R1,#1
6570 ADDEQ R9,wp,#surname
6580 .sncopy
6590 LDRB R2,[R0],#1
6600 CMP R2,#ASC"a"
6610 BLT letok
6620 CMP R2,#ASC"z"
6630 SUBLE R2,R2,#32
6640 .letok
6650 STRB R2,[R9],#1
6660 CMP R2,#13
6670 CMPNE R2,#32
6680 BNE sncopy
6690 SUB R1,R1,#1
6700 CMP R1,#2
6710 MOVLT R2,#0
6720 STRLTB R2,[R9,#-1]
6730 CMP R1,#0
6740 BNE snloop
6750 .splat
6760 LDMFD (sp)!,{R0-R2,pc}
6770 :
6780 .findentry
6790 STMFD (sp)!,{R1-R2,R9-R11,link}
6800 CMP R1,#1
6810 BNE noquicky
6820 FNadr(R9,namelist)
6830 FNadr(R10,surname)
6840 .quicky
6850 LDR R8,[R9]
6860 CMP R8,#0
6870 BEQ noquicky
6880 ADD R11,R8,#4
6890 LDRB R0,[R10]
6900 LDRB R1,[R11]
6910 BL toupper
6920 CMP R0,R1
6930 BLT noquicky
6940 BNE nextquick
6950 MOV R2,#1
6960 .quickcomp
6970 LDRB R0,[R10,R2]
6980 LDRB R1,[R11,R2]
6990 BL toupper
7000 ADD R2,R2,#1
7010 CMP R0,R1
7020 BNE nextquick
7030 CMP R0,#0
7040 BNE quickcomp
7050 B foundit
7060 .nextquick
7070 MOV R9,R8
7080 B quicky
7090 .noquicky
7100 FNadr(R9,namelist)
7110 .slowy
7120 LDR R8,[R9]
7130 CMP R8,#0
7140 MOVEQS R0,#0
7150 BEQ notfound
7160 ADD R11,R8,#4
7170 BL skipto0
7180 MOV R2,#0
7190 FNadr(R10,surname)
7200 .slowcomp
7210 LDRB R0,[R10,R2]
7220 LDRB R1,[R11,R2]
7230 BL toupper
7240 ADD R2,R2,#1
7250 CMP R0,R1
7260 BNE nextslow
7270 CMP R0,#0
7280 BNE slowcomp
7290 FNadr(R10,forename)
7300 LDRB R0,[R10]
7310 CMP R0,#0
7320 BEQ foundit
7330 BL skipto0
7340 MOV R2,#0
7350 .slowercomp
7360 LDRB R0,[R10],#1
7370 CMP R0,#0
7380 BEQ foundit
7390 CMP R0,#32
7400 BEQ aspace
7410 LDRB R1,[R11,R2]
7420 BL toupper
7430 ADD R2,R2,#1
7440 CMP R0,R1
7450 BEQ slowercomp
7460 .nextslow
7470 MOV R9,R8
7480 B slowy
7490 .aspace
7500 LDRB R1,[R11,R2]
7510 ADD R2,R2,#1
7520 CMP R1,#32
7530 BNE aspace
7540 B slowercomp
7550 .foundit
7560 MOVS R0,R9
7570 .notfound
7580 LDMFD (sp)!,{R1-R2,R9-R11,pc}
7590 :
7600 .toupper
7610 CMP R1,#ASC"a"
7620 MOVLT pc,link
7630 CMP R1,#ASC"z"
7640 SUBLE R1,R1,#32
7650 MOV pc,link
7660 :
7670 .skipto0
7680 LDRB R0,[R11],#1
7690 CMP R0,#0
7700 BNE skipto0
7710 MOV pc,link
7720 :
7730 .off
7740 STMFD (sp)!,{R0-R2,link}
7750 MOV R0,#134
7760 SWI "OS_Byte"
7770 FNstr(R1,xpos)
7780 FNstr(R2,ypos)
7790 SWI "OS_RemoveCursors"
7800 LDMFD (sp)!,{R0-R2,pc}
7810 :
7820 .on
7830 STMFD (sp)!,{R0,link}
7840 SWI 256+31
7850 FNldr(R0,xpos)
7860 SWI "OS_WriteC"
7870 FNldr(R0,ypos)
7880 SWI "OS_WriteC"
7890 SWI "OS_RestoreCursors"
7900 LDMFD (sp)!,{R0,pc}
7910 :
7920 .expand
7930 STMFD (sp)!,{R0-R4,R9,link}
7940 ADD R1,R0,#4
7950 MOV R2,#fields
7960 MOV R3,wp
7970 ADD R9,R3,#(fields-1)*fieldsize
7980 .exploop
7990 ADD R9,R9,#1
8000 MOV R4,#0
8010 .expcopy
8020 LDRB R0,[R1],#1
8030 CMP R0,#0
8040 BEQ expdone
8050 STRB R0,[R9,R4]
8060 ADD R4,R4,#1
8070 B expcopy
8080 .expdone
8090 STRB R4,[R9,#-1]
8100 MOV R9,R3
8110 ADD R3,R3,#fieldsize
8120 SUBS R2,R2,#1
8130 BNE exploop
8140 LDMFD (sp)!,{R0-R4,R9,pc}
8150 :
8160 .copyfield
8170 STMFD (sp)!,{R0-R2,link}
8180 ADD R2,wp,R1,ASL #6
8190 LDRB len,[R2],#1
8200 CMP len,#0
8210 BEQ nocf
8220 .cfloop
8230 LDRB R0,[R2],#1
8240 STRB R0,[R9],#1
8250 SUBS len,len,#1
8260 BNE cfloop
8270 .nocf
8280 MOV R0,#0
8290 STRB R0,[R9],#1
8300 LDMFD (sp)!,{R0-R2,pc}
8310 :
8320 .showfield
8330 STMFD (sp)!,{R0-R2,link}
8340 LDRB R0,[wp,R1,ASL #6]
8350 CMP R0,#0
8360 BEQ noentry
8370 BL namefield
8380 MOV R2,#0
8390 BL showentry
8400 SWINE "OS_NewLine"
8410 .noentry
8420 LDMFD (sp)!,{R0-R2,pc}
8430 :
8440 .namefield
8450 STMFD (sp)!,{R0-R1,link}
8460 ADR R0,fieldnames
8470 ADD R0,R0,R1,ASL #3
8480 MOV R1,#8
8490 SWI "OS_WriteN"
8500 SWI "OS_WriteS"
8510 EQUS " : "+CHR$0
8520 LDMFD (sp)!,{R0-R1,pc}
8530 :
8540 .fieldnames
8550 EQUS "Surname "
8560 EQUS "Forename"
8570 EQUS "Addr 1  "
8580 EQUS "Addr 2  "
8590 EQUS "Addr 3  "
8600 EQUS "Town    "
8610 EQUS "City    "
8620 EQUS "County  "
8630 EQUS "Postcode"
8640 EQUS "Home    "
8650 EQUS "Work    "
8660 EQUS "Quickref"
8670 :
8680 .showentry
8690 STMFD (sp)!,{R0-R2,link}
8700 ADD R0,wp,R1,ASL #6
8710 LDRB R1,[R0],#1
8720 CMP R1,#0
8730 BEQ noentry
8740 CMP R2,#0
8750 BEQ nospaces
8760 .spcloop
8770 SWI 256+32
8780 SUBS R2,R2,#1
8790 BNE spcloop
8800 .nospaces
8810 SWI "OS_WriteN"
8820 .noentry
8830 CMP R1,#0
8840 LDMFD (sp)!,{R0-R2,pc}
8850 :
8860 .initget
8870 STMFD (sp)!,{R1,link}
8880 BL splitname
8890 BL findentry
8900 BEQ ohwell
8910 LDR R0,[R0]
8920 BL expand
8930 MOVS R1,#1
8940 .ohwell
8950 LDMFD (sp)!,{R1,pc}
8960 :
8970 .phone
8980 STMFD (sp)!,{R0-R9,R12,link}
8990 LDR wp,[wp]
9000 BL initget
9010 BEQ nophone
9020 MOV R1,#0
9030 BL showfield
9040 MOV R1,#1
9050 BL showfield
9060 MOV R1,#9
9070 BL showfield
9080 MOV R1,#10
9090 BL showfield
9100 .nophone
```

Continued ▶

ADDRESS BOOK

◀ Continued

```
9110 LDMFD (sp)!,{R0-R9,R12,pc}
9120 :
9130 .address
9140 STMFD (sp)!,{R0-R9,R12,link}
9150 LDR wp,[wp]
9160 BL initget
9170 BEQ noaddr
9180 MOV R1,#0
9190 .addrloop
9200 BL showfield
9210 ADD R1,R1,#1
9220 CMP R1,#addrlines+2
9230 BLT addrloop
9240 .noaddr
9250 LDMFD (sp)!,{R0-R9,R12,pc}
9260 :
9270 .label
9280 STMFD (sp)!,{R0-R9,R12,link}
9290 LDR wp,[wp]
9300 MOV R9,R0
9310 MOV R3,#0
9320 CMP R1,#1
9330 BEQ notab
9340 .checktab
9350 LDRB R2,[R9],#1
9360 CMP R2,#32
9370 BEQ gottab
9380 SUB R2,R2,#ASC"0"
9390 CMP R2,#10
9400 MOVCS R3,#0
9410 BCS notab
9420 ADD R3,R3,R3,ASL #2
9430 ADD R3,R2,R3,ASL #1
9440 B checktab
9450 .gottab
9460 CMP R3,#256
9470 BCS tabtoobig
9480 .skipspc
9490 LDRB R2,[R9],#1
9500 CMP R2,#32
9510 BEQ skipspc
9520 SUB R0,R9,#1
9530 SUB R1,R1,#1
9540 .notab
9550 FNstr(R3,labtab)
9560 BL initget
9570 BEQ nolabel
9580 MOV R1,#1
9590 FNldr(R2,labtab)
9600 BL showentry
9610 MOV R1,#0
9620 MOVNE R2,#1
9630 MOVEQ R2,#0
9640 BL showentry
9650 SWINE "OS_NewLine"
9660 MOV R1,#2
9670 .labloop
9680 FNldr(R2,labtab)
9690 BL showentry
9700 SWINE "OS_NewLine"
9710 ADD R1,R1,#1
9720 CMP R1,#addrlines+2
9730 BLT labloop
9740 .nolabel
9750 LDMFD (sp)!,{R0-R9,R12,pc}
9760 :
9770 .tabtoobig
9780 LDMFD (sp)!,{R0-R9,R12,link}
9790 ADR R0,taberr
9800 ORRS pc,link,#(1<<28)
9810 .taberr
9820 EQUD 0
9830 EQUS "Tab value too large"+CHR$0
9840 ALIGN
9850 :
9860 .bookinfo
9870 STMFD (sp)!,{R0-R9,R12,link}
9880 LDR wp,[wp]
9890 SWI "OS_WriteS"
9900 EQUS "Filename : "+CHR$0
9910 ALIGN
9920 FNadr(R0,default)
9930 SWI "OS_Write0"
9940 SWI "OS_NewLine"
9950 FNadr(R9,namelist)
9960 MOV R1,#0
9970 MOV R2,#0
9980 .infoloop
9990 LDR R3,[R9]
10000 CMP R3,#0
10010 BEQ gotinfo
10020 ADD R1,R1,#1
10030 ADD R3,R3,#4
10040 SUB R9,R3,#4
10050 MOV R4,#fields
10060 .getsize
10070 LDRB R0,[R3],#1
10080 ADD R2,R2,#1
10090 CMP R0,#0
10100 SUBEQS R4,R4,#1
10110 BNE getsize
10120 B infoloop
10130 .gotinfo
10140 SWI "OS_WriteS"
10150 EQUS "Entries  : "+CHR$0
10160 ALIGN
10170 MOV R0,R1
10180 BL decimal
10190 SWI "OS_WriteS"
10200 EQUS "RMA used : "+CHR$0
10210 ALIGN
10220 MOV R0,R2
10230 BL decimal
10240 SWI "OS_WriteS"
10250 EQUS "RMA free : "+CHR$0
10260 ALIGN
10270 MOV R1,R2
10280 MOV R0,#5
10290 SWI "OS_Module"
10300 SUB R0,R3,R1
10310 BL decimal
10320 LDMFD (sp)!,{R0-R9,R12,pc}
10330 :
10340 .decimal
10350 STMFD (sp)!,{R0-R2,link}
10360 FNadr(R1,number)
10370 MOV R2,#16
10380 SWI "OS_ConvertCardinal4"
10390 SWI "OS_Write0"
10400 SWI "OS_NewLine"
10410 LDMFD (sp)!,{R0-R2,pc}
10420 :
10430 .listall
10440 STMFD (sp)!,{R0-R9,R12,link}
10450 LDR wp,[wp]
10460 BL splitname
10470 FNadr(R9,namelist)
10480 FNadr(R10,surname)
10490 .trymatch
10500 LDR R8,[R9]
10510 CMP R8,#0
10520 BEQ listend
10530 ADD R11,R8,#4
10540 BL skipto0
10550 MOV R2,#0
10560 .listcomp
10570 LDRB R0,[R10,R2]
10580 CMP R0,#0
10590 BEQ dothisone
10600 LDRB R1,[R11,R2]
10610 BL toupper
10620 ADD R2,R2,#1
10630 CMP R0,R1
10640 BEQ listcomp
10650 MOV R9,R8
10660 B trymatch
10670 .dothisone
10680 MOV R0,R11
10690 SWI "OS_Write0"
10700 LDRB R1,[R0]
10710 CMP R1,#0
10720 SWINE 256+ASC","
10730 SWINE 256+32
10740 SWINE "OS_Write0"
10750 SWI "OS_NewLine"
10760 MOV R9,R8
10770 B trymatch
10780 .listend
10790 LDMFD (sp)!,{R0-R9,R12,pc}
10800 ]NEXT
10810 ENDPROC
10820 :
10830 DEF FNcom(com$,min,max,rout,syntax
,help)
10840 [OPT pass
10850 EQUS com$:EQUB 0
10860 ALIGN
10870 EQUD rout
10880 EQUD min+(max<<16)
10890 EQUD syntax
10900 EQUD help
10910 ]
10920 =""
10930 :
10940 DEF FNhelp(RETURN label,str$,end)
10950 [OPT pass
10960 .label
10970 EQUS str$:EQUB end
10980 ]
10990 =""
11000 :
11010 DEF FNldr(reg,addr)
11020 [OPT pass
11030 LDR reg,[wp,#addr]
11040 ]
11050 =""
11060 :
11070 DEF FNstr(reg,addr)
11080 [OPT pass
11090 STR reg,[wp,#addr]
11100 ]
11110 =""
11120 :
11130 DEF FNadr(reg,addr)
11140 [OPT pass
11150 ADD reg,wp,#addr
11160 ]
11170 =""
11180 :
11190 DEF FNalloc(size)
11200 wpaddr += size
11210 = wpaddr - size
```

ARM PROGRAMMING

Listing 1

```
   10 REM >Listing1
   20 REM Disk Directory Tree Lister
   30 REM for Archimedes only
   40 REM (c) BBC Acorn User December 19
90
   50 :
   60 DIM code 500
   70 FOR X=0 TO 3 STEP 3
   80 P%=code
   90 [ OPT X
  100 :
  110 \ Program is a utility, so there a
re 1024 bytes of workspace
  120 \ R12 points to bottom of the work
space
  130 \ R13 points to the top of workspa
ce (stack)
  140 \ Pathname grows from R12 up throu
gh the workspace
  150 \ Stack grows down from R13 throug
h the workspace
  160 \ Should be enough space for direc
tory depth of at least 60
  170 :
  180 STMFD R13!,{R14}   \ Store return
address
  190 MOV R11,#0         \ Flag to indic
ate dirall or catall
  200 :                  \ 0 = dirall
  210 MOV R8,#0          \ Length of pat
hname
  220 LDRB R2,[R1],#1    \ Get the first
 byte from command line
  230 CMP R2,#32
  240 BLT badcomline     \ Complain if i
t is a control character
  250 CMP R2,#ASC"-"
  260 BNE transferpath   \ If not an fla
g, get the filename
  270 LDRB R2,[R1],#1    \ Get flag
  280 AND R2,R2,#&DF     \ Convert to Up
per Case
  290 CMP R2,#ASC"F"
  300 MOVEQ R11,#1       \ If F, then li
st files also
  310 :                  \ Flag = 1 to i
ndicate catall
  320 .spaces
  330 LDRB R2,[R1],#1
  340 CMP R2,#ASC" "     \ Find the firs
t character of the second
  350 BEQ spaces         \ Parameter, ig
noring spaces
  360 :
  370 .transferpath      \ Transfer the
pathname to memory
  380 CMP R2,#32         \ If it is a co
ntrol character, then
  390 BLE getonwithit    \ We have got t
he whole pathname
  400 STRB R2,[R12,R8]   \ Otherwise sto
re character
  410 ADD R8,R8,#1
  420 LDRB R2,[R1],#1
  430 B transferpath
  440 :
  450 .getonwithit
  460 MOV R2,#0
  470 CMP R8,#0          \ Make sure we
have a pathname
  480 BEQ badcomline
  490 STRB R2,[R12,R8]   \ Store char 0
at end of pathname
  500 MOV R0,R12         \ Move R0 to po
int at pathname
  510 SWI "XOS_Write0"
  520 SWI "XOS_NewLine"  \ Printout path
name
  530 BVS error          \ Exit if there
 is an error
  540 :
  550 .recurse           \ The main rout
ine
  560 STMFD R13!,{R14}   \ Store return
address
  570 :                  \ Routine is re
cursive and calls itself
  580 MOV R4,#0          \ Which file to
 get
  590 .getfilename
  600 LDMVSFD R13!,{PC}  \ If there has
been an error
  610 :                  \ Overflow (V)
set, then exit
  620 MOV R0,#10         \ OS_BBPB call
type
  630 MOV R1,R12         \ Pointer to pa
thname
  640 ADR R2,datablk     \ Pointer to da
ta block for filename
  650 MOV R3,#1          \ Number of ent
ries to get
  660 MOV R5,#40         \ Size of data
block
  670 MOV R6,#0          \ Specify all f
ilenames
  680 SWI "XOS_GBPB"     \ Get a directo
ry entry
  690 BVS error
  700 LDMCCFD R13!,{PC}  \ If carry clea
r then no files, so exit
  710 LDR R7,[R2,#16]    \ Get object ty
pe
  720 CMP R11,#1
  730 BLEQ printname     \ Print filenam
e if catall
  740 CMP R7,#2          \ Is this a dir
ectory
  750 BEQ gotadir        \ If so, proces
s
  760 B getfilename      \ Otherwise, ge
t next entry
  770 :
  780 .gotadir
  790 STMFD R13!,{R4,R8} \ Store current
 file + pathname length
  800 CMP R11,#0
  810 BLEQ printname     \ Print directo
ry name if dirall
  820 ADD R10,R2,#20
  830 MOV R9,#ASC"."     \ Now add this
directory name to
  840 :
  850 .moveloop          \ The full path
name
  860 STRB R9,[R1,R8]
  870 CMP R9,#0
  880 BEQ carryon
  890 ADD R8,R8,#1
  900 LDRB R9,[R10],#1
  910 B moveloop
  920 .carryon
  930 BL recurse         \ Call recurse
routine so that we
  940 :                  \ Now traverse
the directory we have found
  950 LDMFD R13!,{R4,R8} \ When we retur
n, get old values of
  960 MOV R9,#0          \ Stored variab
les, and remove directory
  970 STRB R9,[R1,R8]    \ Name from the
 full pathname
  980 B getfilename      \ Now go round
and get the next entry
  990 :
 1000 .printname
 1010 STMFD R13!,{R14}
 1020 MOV R9,R8          \ Find full pat
hname length
 1030 MOV R0,#32         \ And print tha
t many spaces
 1040 .spaceloop
 1050 SWI "XOS_WriteC"
 1060 SUBS R9,R9,#1
 1070 BNE spaceloop
 1080 ADD R0,R2,#20
 1090 SWI "XOS_Write0"   \ Printout file
name
 1100 SWI "XOS_NewLine"
 1110 BVS error
 1120 LDMFD R13!,{PC}
 1130 :
 1140 .badcomline        \ Error handler
 1150 ADR R0,badcomerr
 1160 :
 1170 .error
 1180 ADR R3,mask
 1190 LDR R3,[R3]
 1200 TEQP PC,R3
 1210 LDMFD R13!,{PC}
 1220 :
 1230 .badcomerr
 1240 EQUD 42
 1250 EQUS "Syntax: *DirAll (<-f>) <dir
name>"
 1260 EQUB 0
 1270 ALIGN
 1280 .mask EQUD &10000000
 1290 .datablk
 1300 EQUS STRING$(40," ")
 1310 EQUB 0
 1320 ALIGN
 1330 :
 1340 ] NEXT
 1350 OSCLI "SAVE DirAll "+STR$~(code)+"
 "+STR$~(P%)
 1360 *SETTYPE DirAll Utility
```

IMPRESSION II

Impression release 2 is the first major upgrade to the leading DTP package for the Archimedes. It makes the preparation of documents, from the simplest letters to the most complex and intricate designs, easier than it has ever been before. It is the only program designed to be used as a word processor, to handle long documents while at the same time offering the most powerful page layout facilities.

Where word processing and DTP meet

As word processors grow more powerful year by year, Desk-Top-Publishing programs are becoming more like word processors, so that both types of product are evolving in the same direction. However few computers have either the power or a flexible enough operating system to allow the successful integration of the two approaches.

Impression on the Archimedes has successfully combined the best features of word processors and desk-top-publishing programs to create the logical result of that evolution. A word processor that can handle the most complex DTP, and a DTP program that can process words like no other - we call it a document processor.

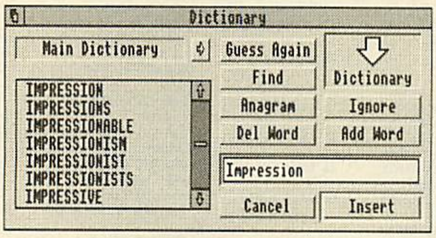
When other computers catch up with the Archimedes, all word processors will be like Impression. Why buy two programs when Impression can handle all your documentation requirements ?

Word processing

To be a successful word processor, a program has to be easy to use, include, amongst other things, real time spell checking, a powerful set of editing tools and the ability to handle documents from the simplest letter to complete books. What's more it has to be fast and responsive in use, something that lets down nearly all DTP programs.

Spelling checker

Spelling checkers have become a necessary tool in reducing errors in documents, not necessarily because they can catch spelling mistakes, but because they can also spot typing errors. The spelling checker supplied with Impression is based on the successful SpellMaster product, enhanced and fully integrated into Impression. It offers check-as-you-type, a 60,000 word main dictionary, up to 8 user extension dictionaries (which can automatically save themselves to disc) and two intelligent guess modes to help identify the correct word (one lists words that sound like the misspelt word, the other lists words based on the most common typing errors). It will even solve crossword and anagram puzzles.



The spelling checker dialogue

Long documents

Impression supports many features to aid the creation of long documents. By employing automatic disc slaving, it can handle documents of practically any size, even on 1Mbyte Archimedes. In fact, the memory available in the machine is no longer the limiting factor. Impression has already been used to produce books and manuals consisting of hundreds of pages, sometimes many megabytes long.

It also supports automatic index and contents compilation, again an enormous time saver. Impression 2 also has the ability to keep headings attached to the following paragraph, so eliminating 'widow' lines at the bottom of pages or columns. This improves the appearance of all documents, short or long.
As you might expect, automatic page and chapter numbering is supported along with the most flexible header and footer system around. These may be any number of lines at any position on the page, and even incorporate graphics. A new feature in Impression 2 allows headers and footers, or any frame, to repeat over a whole document or any specific range of pages.

Styles

Impression's unique style system can be a time saver for all types of word processing and DTP use. The appearance of headings, titles, quotes or any region of text can be made to appear in any combination of a vast range of stylistic effects. Each combination of effects can be given a name and applied to any required region of text with one key press. Styles save time because the combination of effects can be applied in one go rather than individually applying each effect, each time it is required.
Styles are retro-active - any edit or alteration performed to a style will affect all occurrences of that style in the text. For example, if all quotes in a document are set to be italicised, and you want to change them to be bold, this involves just a single style edit.

The Impression style system is unique in two ways; firstly in the number of options available - text can be any size (even as large as the page), any line spacing, any font, any colour (background or foreground). Text may be set to have a strikethrough line or be single or double underlined. Tabs can be leadered (it automatically puts dots between tabs). Paragraphs can have an

automatic ruling line placed after them (of any thickness and colour) etc etc.

Secondly, Impression styles can be applied to any region of text, from a single character to an entire document. They can also overlap, so that one style can be used in a paragraph while another is used for a few words in that paragraph. The above quote example is not possible on other DTP systems since they cannot apply a style to anything less than a paragraph.

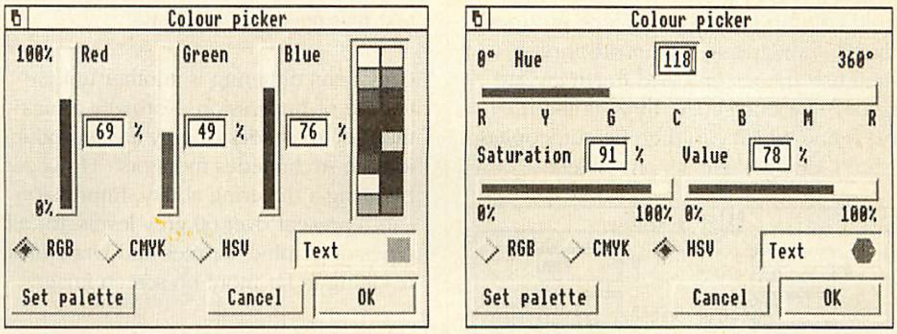
Master pages

Impression master pages are a powerful tool that provides control over the appearance of a whole document. Master pages control the size, layout and structure of all pages in a document. If you want all pages to be based on three columns on A4 paper with a graphic in the corner, then the master page can be set to create all pages in this fashion automatically. However, master pages are really powerful because, like styles, they are retro-active. Any change made to a master page will be reflected throughout a document. So, if you decide to have two columns rather than three, or perhaps arrange the page landscape rather than portrait, this can be achieved by one master page change.

Impression supports any number of master pages (the pages can be any size) and can allow the page size to be changed *after* the document has been created.

Desk Top Publishing

All text and graphics are contained within rectangular frames. When using Impression as a word processor, these frames are created automatically on each new page, as the text flows from page to page. For desk-top-publishing work, the ability to place any frame at any position on the page gives absolute and total freedom of page design. Impression supports those features found in all good



The RGB colour selector (left) has a pre-selection of 16 colours, but allows any colour to be defined. Three alternative colour models are available, such as HSV shown on the right, which allows new colours to be selected in a more intuitive manner. These colour selectors can be used to set the colour of just about anything in Impression - text background and foreground, line and frame colours etc.

DTP programs such as the use of any font, any size. Frames of any size may be placed at any position on the page, and may be set to be transparent or opaque (any colour). By using the Acorn anti-aliased font system, it presents the ultimate in WYSIWYG displays. And since the scale of the page can be altered from 1% to 900% of actual size, it is possible to examine the page in enormous detail so that text of 1pt can be edited, or at smaller scales, complete page spreads can be viewed. Impression even allows more than one window, at different scales, on any document.

Impression also includes two essentials needed for any high quality, professional publishing, hyphenation and text grid-lock. The latter ensures that lines of text align across columns. Examine most quality newspapers or magazines and you will see that, even when pictures or different size headings are used, the main body text remains aligned across columns.

Hyphenation is of course used in virtually all printed material. This advert, magazines, books and all newspapers use hyphenation to improve the look and readability of text, especially when arranged in columns. Impression will hyphenate automatically if required, using a combination of exception dictionary and algorithmic hyphenation. Users can add their own hyphenation points either manually in the text (using soft hyphens) or to words in the hyphenation exception dictionary.

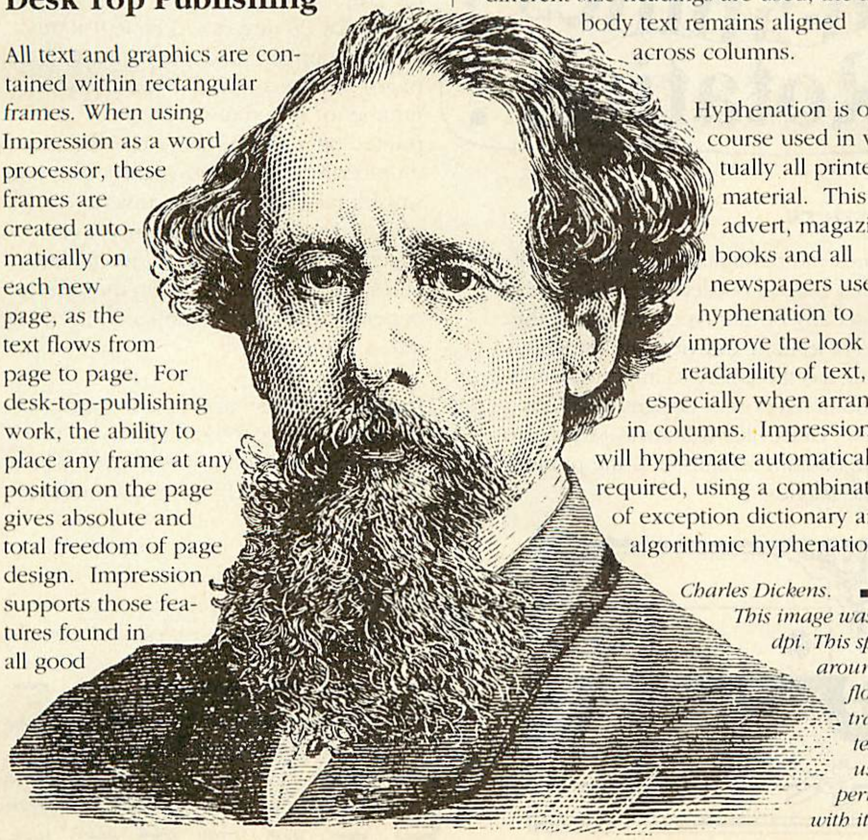
Frames

Since frames are a key part of Impression, a great deal of time has been spent ensuring that all possible frame manipulation tools are provided in a fashion that is convenient and simple to understand. Text frames can be connected to other text frames so that text will flow from frame to frame, in any desired order. (This can be displayed graphically, along with the number of words not fitting within a frame.) Any frame can be re-sized at will, and each frame can have independent repel margins. (Text can be made to repel around another frame, and the repel distance from any side of the frame can be controlled.) Text contained within a frame can also be inset from the frame edge by any amount.

Multiple frame operations

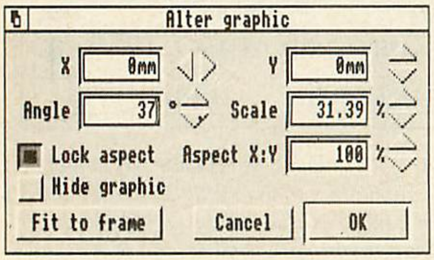
Any set of frames on a page can be temporarily selected together (multiple frame selection). In this mode the frames can be moved together as a group, and they can be copied to other pages or other documents. If one is re-sized, all others will change size by the same amount. (Imagine you want to make three columns slightly narrower - by selecting all three columns and changing the width of one, they will all change by the same amount.)

In addition frames can be permanently grouped, so captions can be permanently



Charles Dickens.
This image was scanned using the Scan-Light Junior scanner at 400 dpi. This sprite was re-touched using !Paint and a mask drawn around the head. Although Impression cannot automatically flow around irregular shapes, by placing a collection of transparent, but repelling, frames around the drawing, the text can be made to repel around any desired shape. By using the group frame facility, the repelling frames can be permanently tied to the drawing, so that the whole image with its repelling frames can be moved and scaled as one.

attached to graphics. This also allows multi-column text frames. Since grouped frames scale and re-size in proportion, three text frames grouped together act exactly like one single, three-column, text frame which can then be cut, copied, moved, dragged etc. as one object.

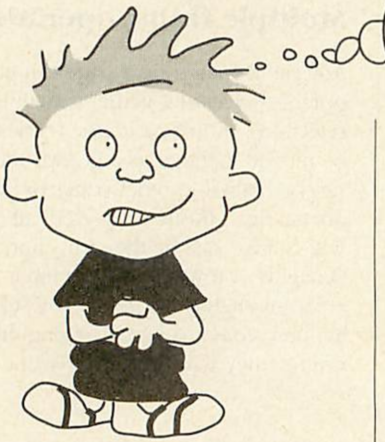


The Alter graphic dialogue allows precise numeric values to be entered.

Graphics

Either line art graphics (for example from !Draw) or bit-image graphics such as sprites, scanned or digitised images, can be placed in a frame. The graphics can be scaled, stretched, cropped as required, all instantaneously. Graphics can also be rotated by any angle, also instantaneously. And it can do all this without going near a dialogue box or menu option. Of course you can enter exact numeric scale or rotate values if required.

All graphics scale and rotate options are performed in real time - there is no delay or calculation required, and neither is the original graphic altered. So graphics can be scaled and rotated as much as you like without suffering cumulative distortion effects. Neither could it be simpler - by using the adjust mouse button, any graphic can be dragged around the



centre of the frame, interactively. Speed tests indicate that rotation of sprite graphics is over 500 times faster than !Paint.

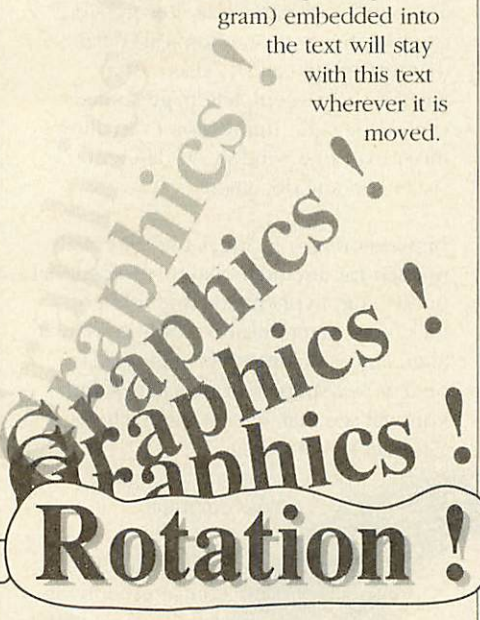
Although Impression cannot directly rotate text, it is supplied with a utility program that will convert lines of text into an outline graphic file. This can be dropped onto a frame where it can be freely rotated; ideal for headlines or any text that needs to stand out.

Grey level dithering is another unique feature of Impression. Normally a maximum of 16 shades of grey are reproducible on Archimedes monitors. However, by using a dithering ability, Impression can represent over 60 grey levels, for all types of graphic - sprites and Draw files, resulting in far more on screen images.

Flowing graphics in text

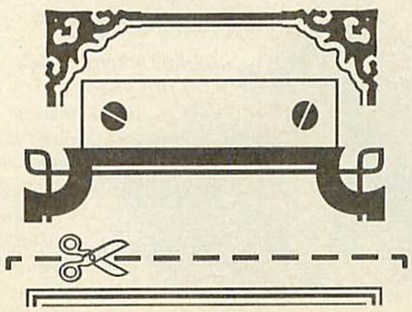
$$x_i = \sum_{k=1}^{n} t_i + m + \frac{A - Bc}{c + d} - y$$

Any document more than a few pages long, that contains graphics, usually requires the graphics to be tied to a particular part of the text. Impression can embed any graphic into the text, even as part of a line if required. For example, the above equation (from our Equasor program) embedded into the text will stay with this text wherever it is moved.



Borders

Frames can be highlighted with one of the ten built-in border types. Each frame can set any border type for each of the sides of a frame individually. Impression 2 now has the ability to import Draw files as additional border designs. And, of course, Draw files will always render to the maximum resolution of the printer - i.e. no jaggies.



Printing

Impression has always had a very wide range of printing options. Impression 2 takes this even further by supporting two completely different modes of operation - draft printing and RISC OS printing.

Word processors typically use the built in character set of the printer - this is fast and ideal for text only documents. DTP programs, on the other hand, use the RISC OS printer drivers that can deliver an exact representation of the page, including all fonts and graphics, to the maximum resolution of the printer. Unfortunately RISC OS printing can typically take 5 or more minutes per page on most dot-matrix printers. (PostScript or direct drive laser printers are the exception to this rule.)

Impression 2 supports both modes. Draft mode allows any document to be printed using the built-in character set of the printer, matching the closest fonts available in the printer to those used on screen. This can be used for obtaining a quick text draft of any document - even complex DTP layouts. If Impression is being used as a text only word processor, this mode is fast and accurate while still allowing full control over printer attributes such as bold, italic, underlining etc. This mode even allows multi-column text, multi-line headers and footers etc and so means that Impression is now a truly effective alternative to traditional character mode word processors such as First Word Plus.

RISC OS printing in Impression allows the page to be scaled by any amount or rotated by 90 degrees. Unique features are its pamphlet mode and multiple pages per sheet options. This allows any number of scaled down pages to be printed on a single sheet - useful for thumbnail printing and vital for proofing since it means that A4 documents can be printed 2 up, as A5 pages on a single sheet of paper. The pamphlet mode takes this further by printing the pages correctly rotated and arranged for folding into a pamphlet.

Impression 2 also allows any number of copies of a page to be fitted on each sheet and reflected printing (professional typeset pages can be printed emulsion side down.)

Some examples of some of the frame borders possible from Impression. You can also design your own with !Draw.

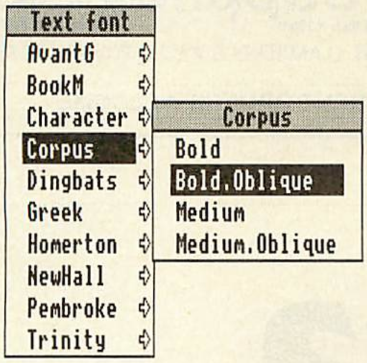
Needless to say, this document was created, arranged, edited and typeset entirely with Impression 2 on a 2Mbyte Archimedes. Line-art originated from

Word substitution

Another unique Impression feature is word substitution or abbreviation expansion - as you type. Any commonly used word or phrase can be assigned any abbreviation and added to a dictionary. When the abbreviation is subsequently entered, it is automatically changed to the fully expanded word or phrase.

Ease of use

Much of the design effort for Impression has gone into the user interface. The program has the minimum of menu options (only 6 main menu items), so new users are not overwhelmed by dozens of menus. Full use is made of dialogue boxes which can remain on screen while editing continues. For example the 'Alter graphic' dialogue, illustrated opposite, will remain on screen and dynamically indicate any alterations performed to the graphic with the mouse. The result is that, although Impression is more powerful than any alternative, it is actually simpler to learn and easier to use.



Fonts are listed by family so reducing the size of menu and making it easier to select any required weight.

RISC OS

Impression is totally RISC OS compatible and follows the Acorn RISC OS guidelines. It integrates with other programs and supports in-memory transfer with co-operating applications. For example importing a picture from !Paint, !Draw or ScanLight involves simply dropping the appropriate icon onto a blank frame in an Impression window.

Impression can access the full RISC OS character set that includes a complete set of European characters. European versions (with translated manuals, menus etc) are available.

!Draw. The scanned image was obtained using Scan-Light Junior. Proofs were produced on a LaserDirect printer (90 seconds for all 4 pages).

The IMPRESSION family

Impression 2 is part of a family of products that includes Impression Junior, a low cost, less capable, yet fully compatible version of Impression. The family therefore covers the broadest possible spread of requirements. All versions can be upgraded to more powerful versions - Junior to Impression 2 for the difference in price, Impression release 1 owners can obtain a free upgrade to release 2. All Impression owners get a regular newsletter, upgrades to future versions and the support of the largest, and oldest, software house in the Acorn market.

Unique Impression points

We could list dozens of features but the following is a list of some of the more important features that we believe set Impression apart from any other word processor or DTP program.

The Impression style system
Graphics rotate
Graphics grey-level dither
Group and multiple frame operations
The spelling checker
Built-in hyphenation
Documents larger than memory
Supremely fast and responsive
Index and contents compilation
Draft and RISC OS quality printing
18 quality outline fonts included
Retro-active master pages
Word substitution as you type
Graphics flowing within the text
The range of printing options
The ease of use
The shortest learning curve
Impression Junior
The history and experience of the Impression developers and the sheer number of man-years of effort put into this product.

Computer Concepts Ltd

Gaddesden Place, Hemel Hempstead, Herts. HP2 6EX
Tel 0442 63933 Fax 0442 231632

Educational discounts

A range of educational discounts, site licences and network licences are available for both Impression release 2 and Impression Junior. Contact Computer Concepts for details.

The package

The package includes: A 300 page manual with reference, introduction, tutorial section and index; the acclaimed 'DTP at a glance' introduction to desk top publishing; five discs including Impression and installation program, a selection of extra utilities (such as the previously mentioned text to Draw converter and a utility that provides over a dozen new screen modes for both normal and multi-sync monitors), a selection of clip-art and example graphics, printer drivers (licensed from Acorn) for a wide range of dot matrix, laser and ink jet printers. 18 quality outline fonts. (12 licenced from Acorn). It also includes 8 non outline, character mode fonts.

Impression is compatible with all (the every growing number of) RISC OS outline fonts and can access all weights of all fonts. The following shows some of the (over 200) symbols from the Dingbats font included as part of the set.



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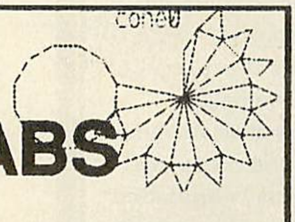
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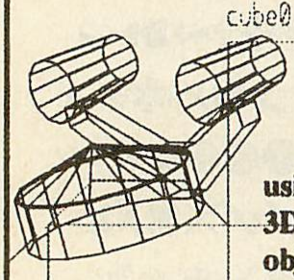
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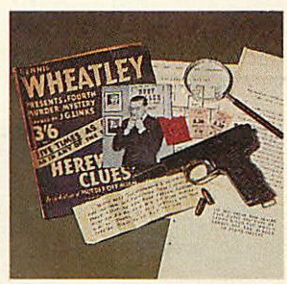


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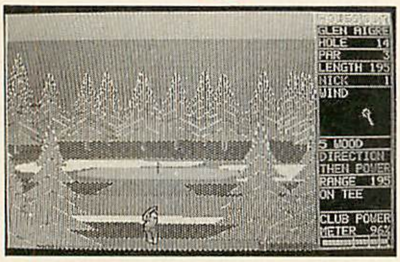
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GAMES

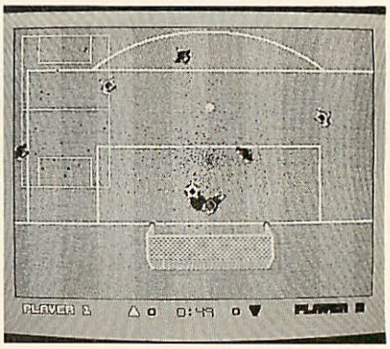
Holed Out!



This exciting 3D golf simulation features atmospheric sound effects, two contrasting 18-hole courses and four skill levels. A constantly updated scoreboard allows you to monitor your progress as you negotiate your way through bunkers, rough and trees. A 'must' for golf enthusiasts, but just as much fun for all game players looking for a challenge.

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Arcade Soccer



This game is football action at its very best. Using an overhead view to make gameplay as exciting as possible, it features corners, sliding tackles, throw-ins, goal kicks, dribbling, shooting, passing, and much more.
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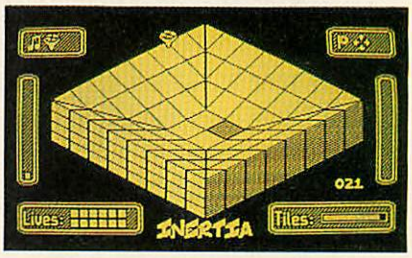
BBC E-Type



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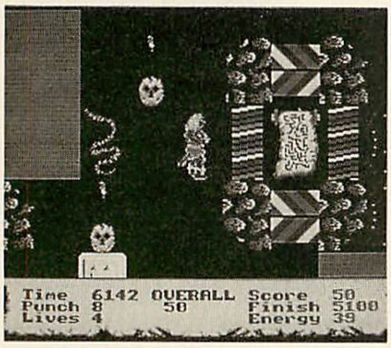
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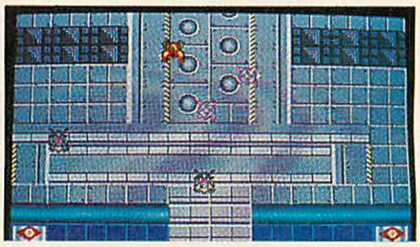
Man at Arms



In the age when the castle was supreme, it took dedicated warriors to overcome its defences. In this challenging game, you are armed with a mighty sword cast from the remains of a thunderbolt which fell from the sky many millenia ago. Also in your possession is a magic potion which makes you invincible for short periods of time. Armed with these, you must penetrate the inner recesses of four castles and do battle with all you find within.

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Quazer



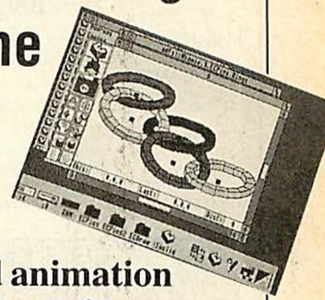
You are in control of the *Quazer* spaceship in this fast action cult spectacular. It features the most amazing graphics with superb parallax scrolling and great sound effects. Reflexes alone are not enough to deal with the waves of co-ordinated alien fleets and their deadly attack formations. You need strategy, defence and bluff to survive.

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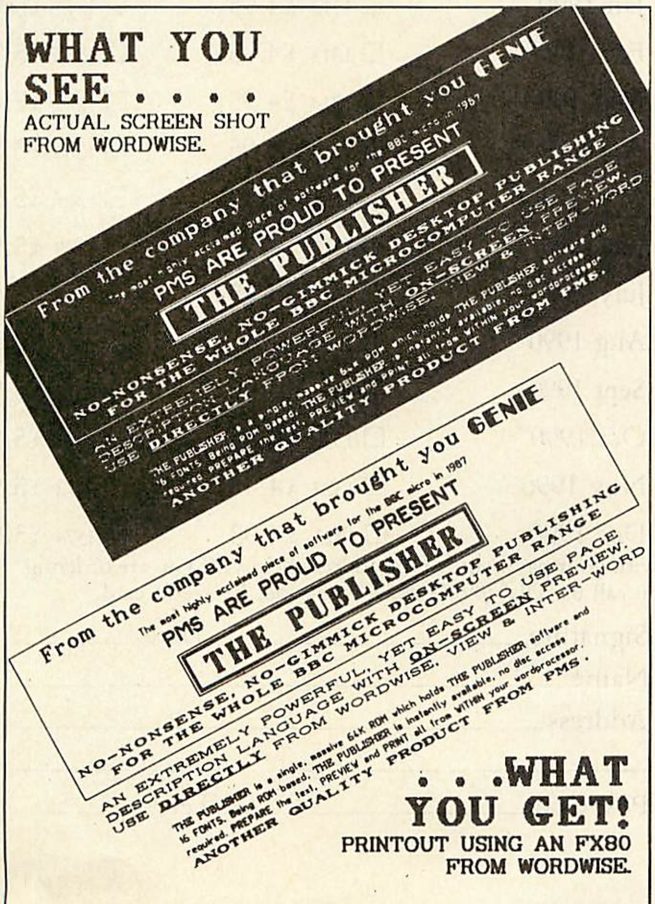




Euclid 2 from Ace Computing is the only multi-tasking 3D graphics and animation system for the Archimedes/A3000. Completely re-written to follow Acorn's guidelines for Risc OS applications, *Euclid 2* is a fully interactive, multi-document, 3D, graphics and animation system.

Designed to be simple for the beginner to get to grips with, it has an intuitive icon-driven single-window interface. You can quickly throw new ideas together, rotate them in real time, zoom in and out, view them in perspective from any position and even show the effects of lights placed anywhere in the scene. *!Draw* files can be exported and imported.

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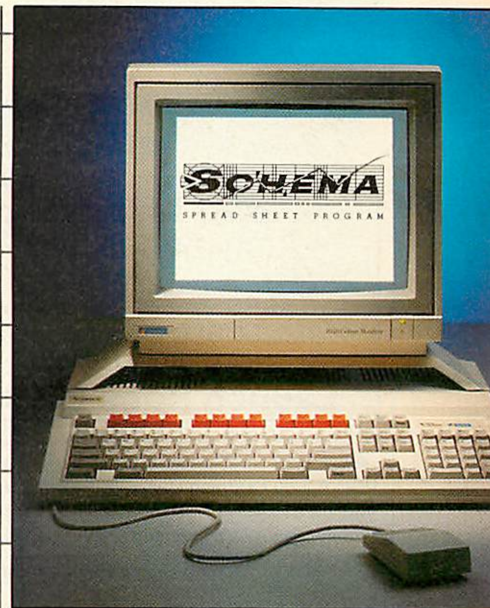
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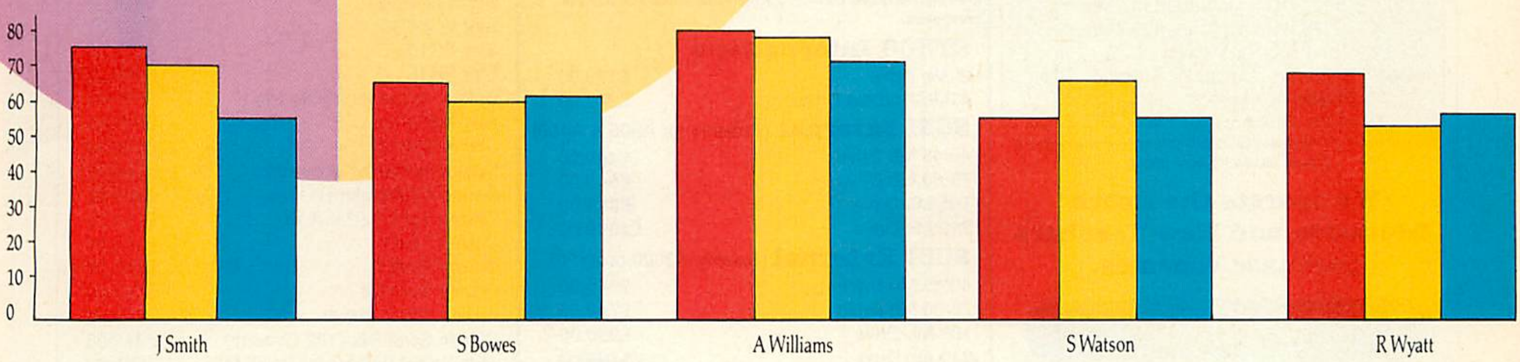
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AVERAGE	69	67	60	67	62
				Overall Average	64





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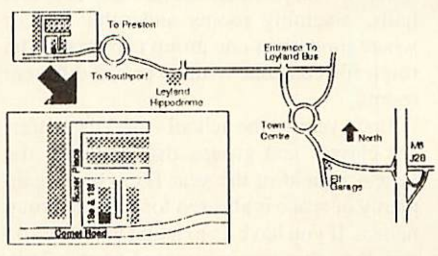
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TIME OUT

DAVE FUTCHER discovers how Minerva has eased the frustration for teachers planning school timetables

Anyone who has ever tried constructing a school or college timetable might dream of simply presenting all the data to a computer and returning later in the day to collect the completed schedule. Instead, the reality is more of a nightmare!

All timetablers have their favourite methods, from the roll of paper, pencil and rubber to expensive commercially produced apparatus using lego-like blocks or multicoloured pegboards.

Micros were not employed in scheduling timetables until packages such as an interrelated suite known as *TT7*, *TT8* and *TT9*, developed by Keith Johnson, appeared. Even then the programs were best used side by side with physical timetabling apparatus so that the machine could carry out, at high speed, the tedious repetitive processing.

Now *Timetabler* from Minerva Software can actually calculate and produce a complete timetable quickly using an A3000 or Archimedes.

Timetabler is a standard, multi-tasking desktop application; although the Risc OS design is not truly orthodox. The package does not install an icon on the icon bar, but instead presents a non-standard menu in a window which must be kept open all the time. It is this menu – with the options Filing, Allocation, Reports and Miscellaneous – that give access to the standard Risc OS menu system via the usual mouse click. *Timetabler* is, in essence, a customised relational database and it uses a key file to point to a number of separate but linked databases files.

Creating the timetable

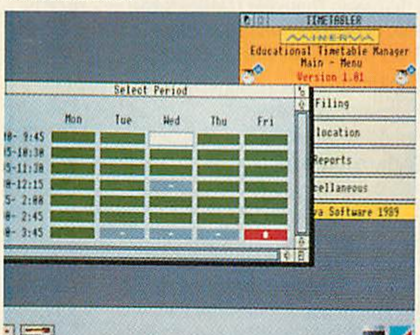
Before *Timetabler* can be used, you need to collect a range of information.

Once this is done, a key file is created. This is a list of the filenames and the specialised datafiles that contain details of courses, rooms, years or groups and staff. The key file also contains a range of information that deals with reporting and printing options.

The key file is made by using the Create submenu of the Filing menu. If you are creating a totally new file, you will also be asked to create the period file. Details, such as the start and stop times of each period, are stored. Periods may be of differing lengths in the day, but *Timetabler* cannot distinguish between different length periods, therefore all would be defined as the same length and given a number, rather than a time, on reports.

The software also expects the same number of periods each day – but, should your school have a different number per day, you create all the days with the number of periods for the longest day and then 'close' the periods on the days with fewer periods. The times can be stored in 12- or 24-hour format and it is possible for periods to have gaps for breaks or lunch.

In all, up to 15 periods per day can be created and up to a 15-day teaching week is allowed – this should suit every possible combination!



Monitoring staff timetables is easy

Once the period file is input, the Room file can be constructed containing a description of every room available. The Create Room window requires the name of the room (up to 16 letters); an abbreviation (up to eight letters), and the room's capacity.

In addition, there is a Maximum Groups in Room entry, which can be used for sports halls, assembly rooms and other spaces where more than one group is present. The room file can cope with up to 255 different rooms.

Each year in the school – and the different classes and groups that make up the year – is held in the year file. Once again plenty of space is allowed for suitable group names. If you have an existing year file you can copy this across by toggling the Copy Existing Year? question. You can then edit the existing details or add extra groups.

The courses file is one of the most important used with the program. Each course needs a name, an abbreviation and a year. A course category may also be specified so it is possible to group chemistry, biology, and general science under the category of science. This is usually done to help speed up the assignment of courses to staff.

Courses in different years may have the same name and abbreviation. A course can be assigned to a single class or a group of classes across a year. If it is the latter, each class will be timetabled concurrently.

The file holds details of all the subjects taught. It is also possible to link courses to others so that they can occur at the same time. They can also be specified as high and low priority.

A wide range of possibilities occur and it is possible to bar one course from being on the same day as another. You can allocate a course to take place at certain periods of the day and it is also possible to force certain courses to occur at the same time.

The staff file contains details of up to 255 members. Details entered include the courses to be taught, the number of allowed free periods and the preferred room.

Dealing with part-time staff poses no problems – neither do teaching staff with, say, administrative or pastoral duties away from the classroom. These can have non-teaching periods allocated to them to effectively 'bar' them when necessary.

There is also an option to create a pupil file. This contains name, sex, year, group and courses taken. *Timetabler* can then print out individual timetables, with details of up to 32,000 students.

Once all the basic details have been entered, the major task of the timetable proc-

ess begins. This is the actual allocation of courses to teaching staff, although it can be done as the staff file is input.

Data entry

Inputting data with *Timetabler* is quick and easy and no special training is required to set up the system or to operate it. While working on the key files, it is possible to copy data already entered and edit information to fit – only a small amount of typing is needed for each entry.

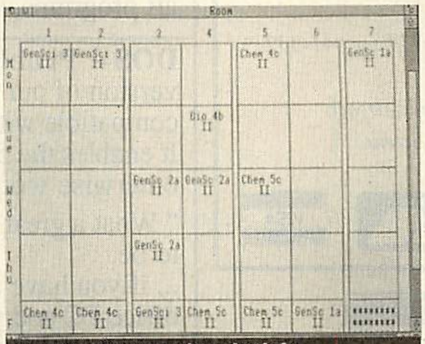
Data is entered and saved and an asterisk appears on the main menu when there is unsaved data. Saving data is quite cumbersome as each of the key files has to be saved separately. Not as simple as it could have been.

Throughout the year *Timetabler* can be used for updates. The Create option is used to add data to the existing files, which means a new teacher or an additional course can be added easily. The new data does not normally disrupt the existing timetable.

At the heart of the software lies the auto-allocating feature, enabling all the results of the data entry to be analysed and the timetable designed.

Timetabler can allocate courses automatically, avoiding clashes and conflicts between staff, courses and rooms. Allocation can be manual, automatic or mixed. Therefore any course that has to be held at a fixed time should be manually allocated first and the timetable saved before auto-allocation for re-use.

While auto-allocation is in operation, three progress boxes are displayed. The first shows how many periods have been allocated so far; the second indicates the year being allocated, and the third indicates the course concerned. Often the allocation is so fast that you cannot read the data, but periods which are difficult to fit in will remain displayed for a few moments. After allocation, a dialogue appears with the number (if any) of the periods that have failed to allocate. A report on the reasons for the unallocated courses can be obtained from the Reports menu.



A particular room's schedule

Timetabler will order courses according to a set of pre-defined weightings. It will try to distribute the courses across the week, with blocked periods allocated first and single periods fitted around block periods it will try to allocate the same staff to a course and will also allocate courses to part-time staff first and ensure that they have a full timetable.

Timetabler has a very comprehensive set of reports, ranging from timetables for individual teachers to full timetable print out. Some of these are designed to help in creating a timetable and spotting any problems while other reports are output as actual timetables. To see what a particular member of staff is teaching in a particular period you click SELECT on Staff. A window appears listing all the staff and you click on any name to display a Select Period weekly timetable for that member of staff. Those periods in which the member of staff is teaching are indicated by a green period block and non-teaching periods by a grey block with a central white dash. If you click the green period, a window will appear with the full details of the lesson, the room, the year and the group displayed, along with the subject and time of the lesson.

Organising cover can be a nightmare, but, with *Timetabler*, it is no problem. It can quickly provide either a weekly or a single period report as to who is available for cover. A great calmer of disgruntled staff is the feature that allows the covering staff to be displayed in order of suitability and workload. A report of the free staff can also be produced.

Conclusion

Timetabler is a fine piece of software for entering the data and creating a timetable automatically. However the real test of a package is its ability to deal with special cases – the sort of problems that schools and colleges face in the real world.

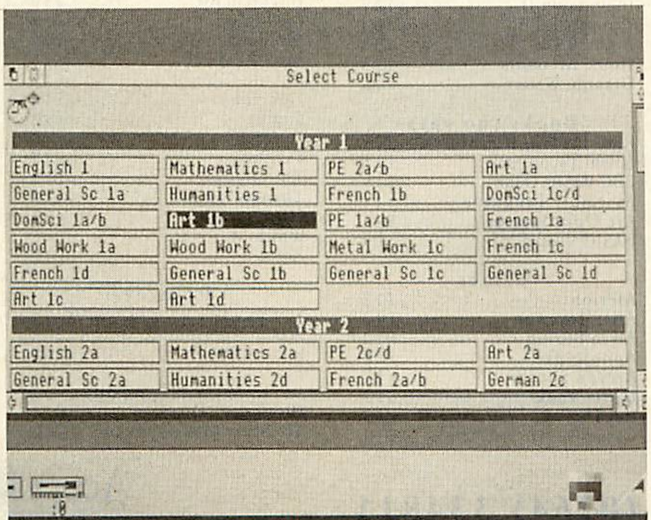
Without a doubt, the package can deal with problems and produce sensible working timetables. Remember this is the program that does not produce clash tables to show why the timetable you have designed does not work – *Timetabler* actually produces working timetables that do *not* clash!

It has the capacity for large and complex timetabling applications, making it an invaluable tool for school and college administration. It can be set up with ease to meet most, if not all special requirements and combinations of staff, pupils or students and administration.

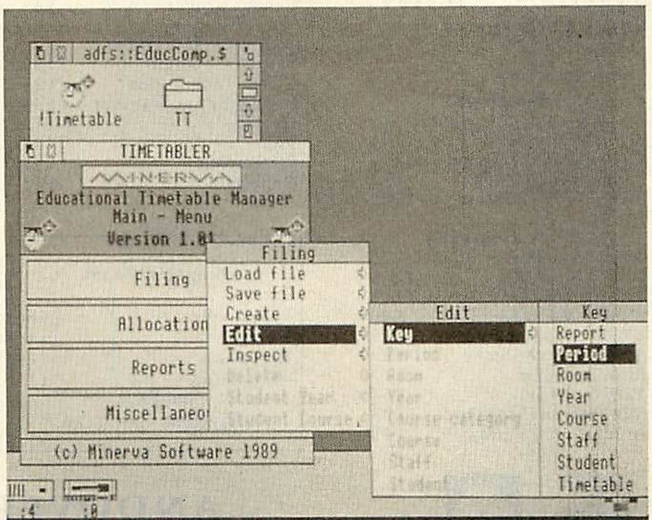
It enables conflict-free timetables to be produced for educational establishments with comparative ease.

At almost £700 it seems expensive, but not when compared with some IBM PC timetabling packages. Its cost really should be judged against the staff time and effort it will save.

Timetabler *is available for the Archimedes series and the BBC A3000 and costs £688.85. It is available from Minerva Software, Minerva House, Baring Crescent, Exeter, Devon EX1 1TL.*

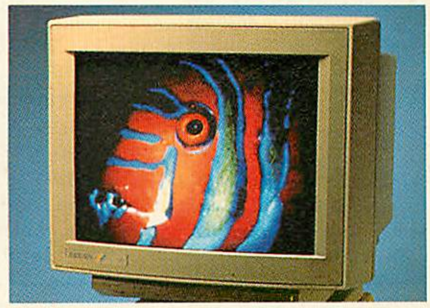


Timetabler can allocate courses automatically . . .



. . . saving staff time and effort. However it is expensive

MULTIVISION MAGIC



Sony's Trinitron tube technology lies at the heart of the new colour monitor from Taxan. **PAUL JAMES** reports

Just when you thought monitor quality couldn't get any better, Taxan springs a surprise.

The sleek 14in Taxan Multivision 795 was not specifically designed with the Arc in mind, but it will work in native multisync modes. Incorporating Sony's Trinitron CRT technology, the black screen is cylindrical in shape and has a vertically flat surface.

The monitor has a built-in swivel stand which makes adjustment easy and helps eliminate eyestrain.

After firing up, you are presented with an unusable screen display. This is because without Atomwide's VIDC enhancer (which is supplied with the monitor and described below) the monitor will only work in multisync modes, 18 - 21 and 25 - 28. With the machine's desktop configured to mode 20 before power up, you can really appreciate this monitor's qualities.

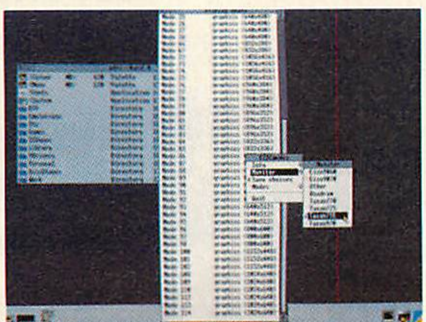
Arc users are forever changing modes and adjusting controls, such as vertical height and horizontal positioning. On the Taxan 795, these adjustments are made easy by the fact that all user controls are set neatly under the screen. There is no fiddling around the back to fit your raster onto the display and adjustments are easy to make. There is a small switch on the front panel which turns the monitor into a VGA only, centralising the screen display and sizing it to occupy the whole screen. This is useful when using modes 27 or 28.

The display quality is really quite unbelievable. Using single gun technology, super fine mesh screen and black Trinitron tube, the colours are bright and true and the screen is very still. The clarity is such that it looks like a drawing on a sheet of paper has been stuck onto the display.

Text is very clear and the edges are sharp, although a very slight wobble can be detected when using white on black text.

Unfortunately, A310 users whose video sockets pump out a rather smaller voltage than they should may find that the display is rather dim. No doubt there is an internal adjustment inside to rectify this, although that would be a dealer-only service.

If you are thinking of buying this monitor for use on an unexpanded Arc, then think again. To take full advantage of this product you need to upgrade your machine – using multisync-only modes eats up a large chunk of memory, so more than one meg on your Arc is a must. Also recommended, although not essential, is an Arm3 upgrade – in large bandwidth modes, much of the available clock time is taken by the VIDC chip. In these modes, Arm3-less, you can actually watch the Arc chug away at drawing the individual lines to make up a window. However, with Arm3 fitted, these modes become very usable and make the Arc an even more exciting machine.



Atomwide's VIDC enhancer software

Onto the VIDC enhancer, made by Atomwide, for the 795. This is simply a very small PCB with a new crystal and several flywires. Although the monitor is just usable without it, fitting the enhancer is a must. This is a simple process, although you will need to remove any podules to gain access to the four pins it sits on. Fitting the enhancer to work with the supplied software is a component level service as it involves soldering – doing it yourself may void your warranty. Using a toggle switch attached to the VIDC eliminates the need for soldering or software. What the software does, with a little help from the hardware, is to redefine all modes. It sits on the icon bar and in essence replaces the mode option in the palette icon supplying a list of all available modes. It takes into account the type of monitor you have connected and tweaks the output clock so that all modes are centralised on the screen. You may still need to adjust the vertical height of the raster. It also provides new modes itself – mode 102 is very impressive, allowing two reduced A4 sized drawfiles to remain on screen, both very readable.

Some software, generally games, is incompatible with this monitor. This is because most games kill off unwanted modules and if this includes the VIDC enhancer then the screen display becomes unusable.

The Taxan 795 is an excellent monitor. If you are serious about how your work looks on screen, then this monitor is a good option – unless you have an A310.

The Taxan 795 Multivision includes an Atomwide VIDC enhancer and Acorn video cable (nine-pin) and costs £804. For further details contact: Taxan (UK) Ltd, Taxan House, Cookham Road, Bracknell, Berks RG12 1RB.

TECHNICAL SPECIFICATION

Size	14in black Triniton
Face Treatment	Non-glare silica coating
H Scan Frequency	30 - 57 KHz
V Scan Frequency	50 - 100 Hz
Bandwidth	>50 MHz
Input Video Signal	RGB analogue 0.7Vp-p 75
Input Video Sync	Sync on green 0.3Vp-p 75 positive H/V Composite 1.0 - 5.5 Vp-p 1K positive H/V Separate 1.0 -5.5 Vp-p 1K positive/negative
Input Terminal	15 pin D-type (lead included)
Display Colours	Unlimited
Display Area	240 x 180 (adjustable)
Display Resolution	1024 x 768 (non-interlaced)
Display Format	5676 characters (8x8 dots)
Front Controls	Power, contrast, brightness, auto size, H/V size, H/V positive
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Dimensions	348(w)x349 (h)x405(d)
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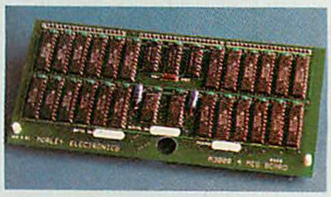
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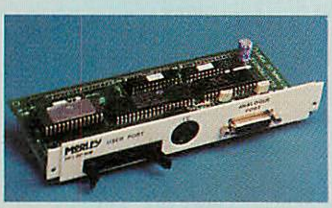
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Philips 8833	£225	300 2 Slot Backplane	£37
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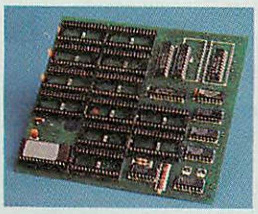
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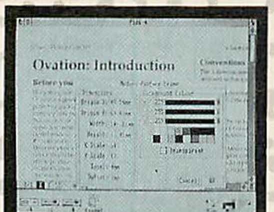
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FIRST IMPRESSIONS

For those who find desktop publishing with Impression just a little too powerful, there's now a junior version. **GRAHAM BELL** examines its merit

Impression has become one of the 'standards' of Archimedes software: Acorn itself has taken out a licence to use it. But it remains a complex bit of software, and the full capabilities of desktop publishing could be overkill for most ordinary wordprocessing – the sort we all do. Furthermore, there still isn't a fully wysiwyg wordprocessor for the Arc: both *Pipedream* and *First Word Plus* are fundamentally character mode programs, although *Pipedream* can use the Arc's outline fonts and both can include graphics.

Given this, the aim of cutting out the more complicated DTP features of *Impression* and making it a little more handy looks like a winner – hence *Impression Junior*. But it's difficult to define where wordprocessing ends and desktop publishing begins, so what do you remove?

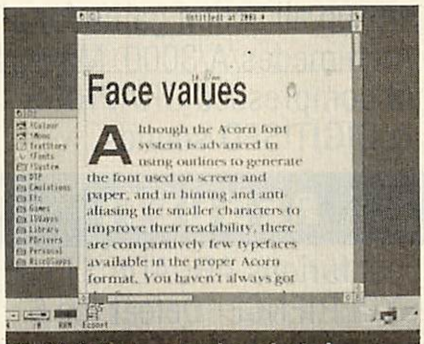
For those familiar with *Impression*, it loses master pages, guide frames, the style editor, index generation, multiple views and a few typographical niceties. But the only sensible way to look at *Junior* is to consider it as a totally new wordprocessor, competing directly with *First Word Plus*.

The software comes on four discs, bundled with a selection of outline fonts, example documents, utilities and a limited selection of clip-art. It's unprotected, there's no dongle to worry about, and you can make copies or install it on a hard disc without trouble. There's also the book *DTP at a Glance* by Rob Pickering, which is a good introduction to a lot of the terms like typeface, point and leading which may be unfamiliar, and gives a few pointers to what looks good on the page. The *Junior* manual contains a tutorial that should get even a novice going.

Junior runs in the normal Risc OS fashion. Each time you start, a registration number pops up on screen for a few seconds, and then it installs itself on the icon bar. A blank A4 page appears when you click on the icon. Within it is a single frame, into which you can immediately type text. You can also import text from *!Edit* or another application – *First Word Plus*, *Interword* and *View* are all supported through loader modules.

As you type or import text, *Junior* automatically creates new pages and can show graphically, with the Show Flow option, how the text flows off one page onto another. Frames on subsequent pages are copies of the frame on the first page. You can also add new frames, making for example a three-column page like this, and make text flow from the first to the second and third column before a new three-column page is created. The frames on the current page are always used as a guide for new pages, though they can be changed at any time. One of the features of full *Impression* that should not have been removed is frame locking – it's too easy to alter the position of a frame accidentally.

Another type of frame repeats its contents automatically on each page as it is created – so it's easy to set up headers and footers. Frames can be moved about easily, and you can select more than one at once –



Multiple frames can be selected

to move a picture and its caption together for example.

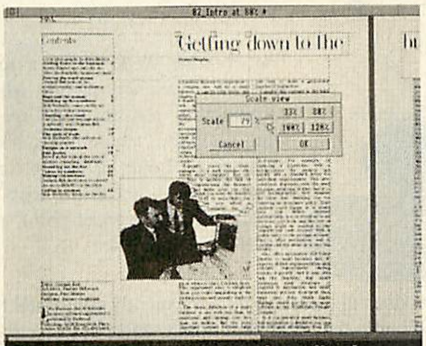
You can look at the text you're editing at any scale – zooming in and out with the function keys is simple. Text editing is simple and convenient; the cursor changes shape to indicate whether you're about to alter the text or move a frame, and there are a host of function and control-key short cuts – many of these will be familiar to *Interword* users. Text reformats automatically, in contrast to *First Word Plus*, and you're also supported by the built-in spelling checker based on *Spellmaster*.

You can set up tables and paragraph indents or outdents with the rulers – on which you can set tab stops with the mouse.

As well as frames containing text, frames can also hold drawings or sprites (illustrations from *!Draw* or *Artisan*, for example). There's full control over the size and aspect ratio of the pictures, and you can add a border around the frame.

Junior uses the anti-aliased fonts to display and print the text, and you can choose any of the fonts installed in your system. The way this works is through effects – you select an area of the text with the mouse, then select the effect you want from the menu, varying the typeface, size or colour as well as more normal wordprocessor effects like centre, underline and super and subscript. Bold and italic are selected by changing the typeface – unlike *Pipedream*, there's no bold effect, which means that if you decide to change the main typeface at the last minute, you've got to manually change all the bold and italics that appear in the text. Search and replace works well for normal text, but you can't search and replace effects.

Printed documents using the outline fonts look excellent, but print slo-o-owly. As well as the outlines, *Junior* can use the draft or NLQ mode of many printers. Several printer modules are included, for common Epson LX and LQ compatible dot-matrix printers, Taxan and Canon nine-pin printers and the Hewlett Packard Deskjet, together with the normal Corpus (Courier) typefaces and a set of blocky 'Character' fonts that match the normal system font. But you must make sure you use them in sizes and styles that are compatible with your printer – an addendum to the manual shows a range of sizes that match fairly well. The printer module does its best to match whatever size you've selected on screen. The modules bypass the Risc OS printer drivers and print very fast, but ignore any graphics in frames. Limited perhaps, but it's more than adequate for most correspondence where speed is more important than quality. An addi-



Even complex pages can be edited

tional family of four character fonts, this time proportionally spaced, is derived from the Porterhouse font supplied with original Risc OS welcome discs. It's not used for draft mode printing, but in certain sizes (eg, 16pt) makes a superb screen font – clear and easy to read because there are no grey pixels in it. If you have 10,000 words to write, this is the font to use: worry about the layout later.

So how do you change all the text to that font, or apply any effect across your whole document? Style up one word as you want, put the cursor in it and select Define Plain Text from the menu – simple.

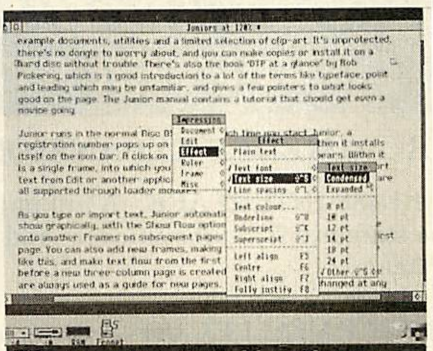
Customising *Junior* is easy. The preferences box allows you to choose whether to load the spelling module automatically, and you can set loader and printer modules to load too. The default document can be altered if there's one particular style of document you write, or you can save templates in the manner of wordprocessor files.

Early versions of *Junior* (and *Impression 2)* suffer from a few minor bugs, for example in exporting text with styles, but these should be fixed now. Exporting to disc without styles works fine.

The utilities with *Junior* are the same as with the original *Impression* – Newmodes making better use of multisync screens in particular, Chars for inserting foreign characters into the text, and Fontdraw for turning small amounts of text into *!Draw* graphics. Fontdraw is superb for doing huge headlines, or for deforming text – you can rotate or squash the letters in *!Draw* and reimport them into a *Junior* graphic frame.

Junior can be used as a simple introduction to DTP – many of the same techniques can be used to create documents, and surprisingly complex layouts can be generated. It lacks the typographical sophistication of *Ovation*, but is on a par with Acorn's *Desktop Publisher* – anything you can do with paragraph styles, you can recreate with effects, albeit a little more laboriously.

Junior is a good introduction to DTP. Simple one-off documents can be created with the minimum of fuss



Effects can be selected from the menu

Outgrowing *Junior* is no problem: you can upgrade to *Impression 2* for the difference in price.

For creating simple one-off documents with a minimum of fuss on the Arc, I can't think of a better option than *Junior*. In the office, however, the lack of any straightforward mailmerging option will count heavily against it – *First Word Plus* and *Pipedream* win here. Mailmerges are possible, using a process of repeating frames overlain by flowing frames into which you import names and addresses, but it's not ideal. This has to be balanced against the clearly better editing facilities and a well-chosen subset of DTP features, a choice between fast character mode and the upward compatibility with *Impression* itself.

IMPRESSION 2

Impression 2 is now available – and registered users will receive a free upgrade direct from Computer Concepts.

Three major innovations differentiate release 2 from the original, and two are also present in *Junior*.

First, release 2 inherits *Junior*'s effects, as well as many of its other new features. In addition to the original's style editor, release 2 has the same range of local effects – typeface, line spacing, underline, colour and so on. When applied, these over-ride just one feature of the normal styles. Effects are, in truth, a set of predefined styles that change only one text attribute at a time. If you apply three effects, the same printed result could be achieved by setting up a single style that alters the three attributes in one go. What you can't do is set up a section of text, using effects, then automatically generate a style to do the same thing – *Junior* uses just this mechanism to set the main text style, but release 2 has no equivalent. The second big change to release 2 is multiple selection and grouping of frames. With *Junior*, this is limited to temporary grouping – several frames can be selected and moved at once. Release 2 goes further, allowing frames to be grouped permanently in exactly the same way as in *!Draw*.

The graphics handling – already much better than Acorn's *Desktop Publisher* – has been beefed up too. Both sprite and drawfiles can be rotated within their frames: sprite rotation in particular is startlingly fast. Combined with the Fontdraw utility, rotated drawfiles make vertical text simpler than ever before, but it's still a two-stage process.

There are minor changes to the text handling: a single frame can now be split into several columns, and there is a horizontal grid system to make it easier to align text in adjacent columns.

Other areas of the program have been tidied up. The typeface menu is now much easier to use – medium, bold, bold italic and so on are placed in a sub menu for each typeface family.

You can now include soft (discretionary) hyphens in text, which over-ride the automatic hyphenation. Chapters may start on left or right pages. Styles can include a conditional page break. And there's a larger range of loader modules with which to import text, including *Wordwise* and CSV.

Four new and well-drawn outline typefaces are supplied: the Pembroke family is equivalent to the Palatino in most Postscript printers.

Release 2 offers a worthwhile set of improvements over the original *Impression* at a time when the *Ovation* and *Tempest* competitors are only just becoming available, and they keep it well ahead. Yet there's still scope for a range of professional enhancements next year...

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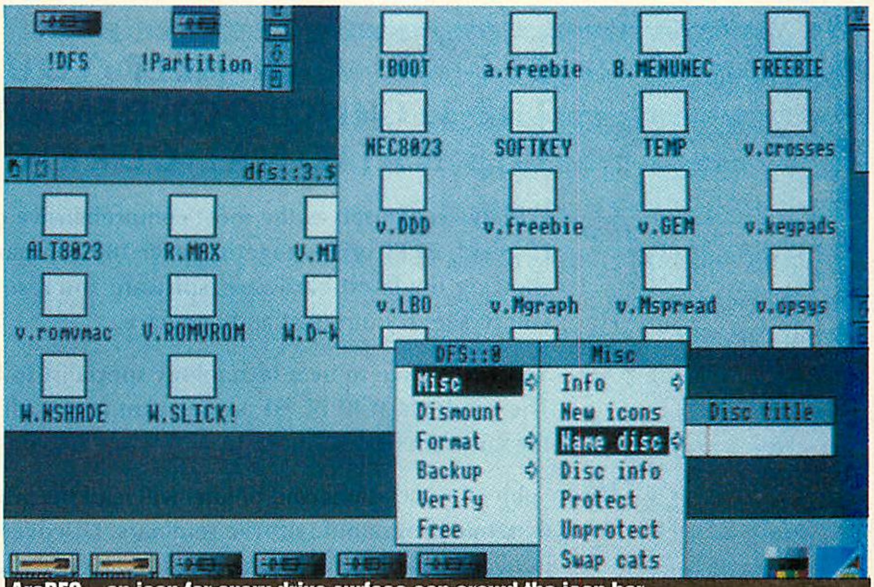
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ArcDFS – an icon for every drive surface can crowd the icon bar

FLEXIBLE FRIENDS

The exchange of information in the computer world is important to the acceptance of the Arc. **SIMON WILLIAMS** looks at the options for transferring files

The Archimedes is a great computer in its own right. With a little assistance, it can 'pretend' to be several other machines as well. The IBM PC and BBC micro are the most common targets for emulation, and a clutch of small PD utilities has popped up to serve the need to copy files from 'alien' discs.

More recently, the commercial firms have got in on the act, producing complete alternative filing systems which let you treat PC and BBC discs in the same way as any running under ADFS.

The three main contenders in the alternative FS market are *ArcDFS* from Dabs Press, *PC Access* from Minerva and *MultiFS* from Arxe Systems. Each offers a slightly different solution to the problem and more or less flexibility in the discs it can handle. For the purposes of this review, MS-Dos includes PC-Dos and DR-Dos, all of which are very similar.

ArcDFS

As the name suggests, *ArcDFS* specialises in handling BBC micro DFS discs and can cope with the Acorn, Solidisk and Watford DFS. It is supplied in a plastic library case on a single disc with a well-presented 40-page manual. There are only two programs on the disc, the *ArcDFS* file itself and a second program to handle DFS partitions on a hard drive or floppy disc. Running *ArcDFS* itself adds four new disc icons to the icon bar on a twin floppy Archimedes – one for each of the DFS disc surfaces :0, :1, :2 and :3.

Any of the DFS surfaces can be treated in much the same way as a regular ADFS disc. Click Select on a drive icon and files from the DFS discs are shown in a directory viewer as normal. Filetypes for Basic programs are picked up automatically to determine icons. Files from a DFS disc can be copied to an ADFS disc simply by opening a viewer onto the target disc and dragging the icons.

Click Menu on any of the DFS icons and you are offered several options similar to those under ADFS. You can format a DFS disc under Acorn, Solidisk or Watford formats, and you can backup a DFS disc. You can also determine the exact type of disc – number of tracks, sectors per track, directories and density – protect the disc and swap catalogues in a dual catalogue format. It is very comprehensive, although compatibility with 40-track discs in 80-track drives is not supported in software – you'll need a hardware switchable drive.

This is only part of what *ArcDFS* can do. Its main business is handling DFS discs from the command line – particularly from within the !65Host emulator. With *ArcDFS* selected as the current filing system, most of the standard BBC DFS filing commands work as you would expect. Thus you can *BACKUP, *DRIVE, *COPY, *DUMP and *WIPE and expect to get DFS-style results. The last three of these commands substitute the ADFS commands with similar names automatically when *ArcDFS* is active.

MultiFS

This is a technically well-conceived filing system. It comes on a single disc in a plastic folder with a 12-page instruction pamphlet. This documentation is perhaps over-technical and would benefit from a more user-oriented tutorial. DFS and Atari ST compatibility warrant two thirds of a page between them, so it's easy to see where the main thrust of *MultiFS* lies.

The program is primarily an MS-Dos filer which enables you to handle 720K MS-Dos discs. It will also read from and write to 360K 5.25in discs, but won't format them. The high density 1.2Mb or 1.44Mb discs are also not supported, as the Arc's disc interface can't handle these.

A lot of care has gone into the way MS-Dos discs are handled by the program. Although unconventional in approach, the techniques chosen ensure that all the information provided by the MS-Dos filenames is preserved in their transfer to ADFS. MS-Dos uses an eight character filename, with an optional three character filetype. The two are separated by a single full-stop character. *MultiFS* reads an MS-Dos disc and creates within its directory viewer a pseudo directory for each file type.

You can copy files freely between viewers and again the alternative filing system provides the normal facilities you would expect from ADFS. The program lets you create MS-Dos system discs by copying the 'boot sector' from a disc formatted under MS-Dos. When you format a new disc, *MultiFS* provides it with a unique discname, generated from the Archimedes clock. Unless you name two discs within the same minute, this technique should be foolproof.

Atari ST compatibility is relatively easy to provide, since the format is heavily based on MS-Dos. DFS discs are handled in a similar way to MS-Dos, only here each

disc surface is given a pseudo directory within the *MultiFS* viewer.

Arxe has provided !65Host naming compatibility, but this seems to tack a leading square bracket or brace onto the front of each filename, which can prove a disadvantage. Four file conversion utilities from the Public Domain are also provided.

PC Access

This program has much the same purpose as *MultiFS* and can read and write MS-Dos discs in 3.5in 720K and 5.25in 360K formats, but can only format 720K discs. It also comes on a single disc in a plastic folder with a 12-page 'adequate' pamphlet for documentation. This is adequate, though it makes fairly dense reading.

Files are directly displayed from an MS-Dos disc in an ADFS-style directory viewer. MS-Dos filenames are displayed in full if less than the maximum 11 characters, otherwise the separating character is omitted. This looks untidy, but is compensated by a translation table which assigns Risc OS filetypes to the most common types found under MS-Dos. The table can be modified to include filetypes of your choice.

No use is made of the MS-Dos volume label, but you can set it from within *PC Access*, and like many of the program's other facilities, it is available from the command line as well as the desktop.

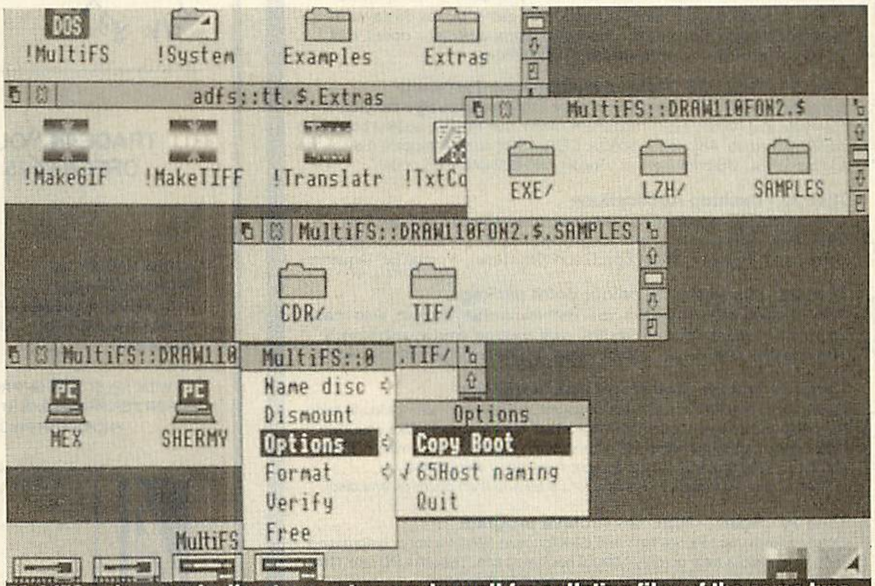
The program will work happily with a hard drive partition and can copy files via its MS-Dos icons, with one equivalent automatically set for each drive on your system.

PC Access is a no-nonsense system which worked well under test. It would be good to see 360K discs supported for formatting. It would also be convenient to be able to quit the filing system and remove the icons from the icon bar!

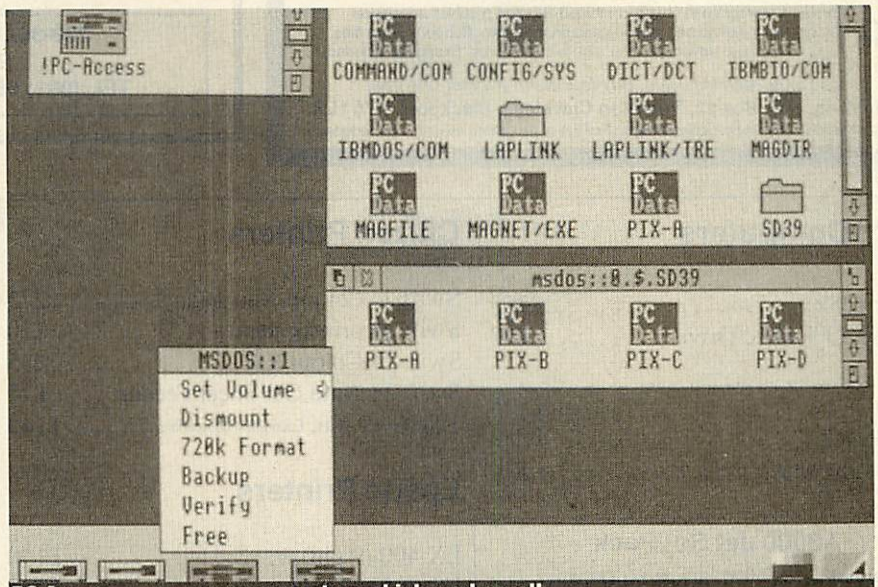
Verdict

If you want to read, write and format DFS discs from a variety of sources and from within the !65Host emulator as well as from the desktop, *ArcDFS* is the only filer on the market that will do the job. It is a sound, solid product, though you can end up with a lot of drive icons on your icon bar.

With less rigourous demands on DFS file copying, *MultiFS* can probably handle your needs, but only from the desktop. It has no accessible command-line support. It does, however, offer the ability to read PC and Atari ST discs as well as DFS ones – indeed its MS-Dos support is its primary purpose. It handles PC files rather better than *PC Access*, as it preserves filetype information as well as PC directory details and uses the MS-Dos volume label. *PC Access* works well, but like *MultiFS* it will not format a 360K, 40-track disc. The need to format an MS-Dos disc on an 'alien' machine is probably limited anyway.



MultiFS – the pseudo directory system works well for collating files of the same type



PC Access – a no-nonsense system which works well

THE PD OPTION

The best known of the Public Domain file copiers, and rightly so, is *!PCDir*. This little utility, which is available on Norwich Computer Services Careware discs among others, provides the file transfer facilities of the commercial products. What it lacks is formatting, verifying or labelling facilities for MS-Dos discs. These should be comparatively easy to add, so a future version of the utility may well be on a par with the likes of *PC Access*.

!DosFS is the other main contender for PC file-swapping, but is currently limited to a single drive (:0) and 720K format. Installation is no more than clicking on the !DosFS icon. The single Dos drive can then be used for MS-Dos filing such as under ADFS.

There is also a Dutch utility called *!DosForm* which quickly formats an MS-Dos system disc. Since this involves writing copyright Microsoft code to the system tracks of the disc, though, readers should beware.

PD DFS readers that work from the desktop are as yet unavailable.

ArcDFS *(£29.95) from Dabs Press, 5 Victoria Lane, Whitefield, Manchester M25 6AL.*

MultiFS *(£36) from Arxe Systems Ltd, PO Box 898, Forest Gate, London, E7 9RG.*

PC Access *(£39.95) from Minerva Software, Minerva House, Baring Crescent, Exeter, Devon EX1 1TL.*

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GAME SHOW

Another year has almost passed by and, in traditional *BAU* style, the Game Show presents a bumper round-up of entertainment software. Also, we look at the first games due next year. So how have the various expectations of Acorn players over the past year turned out?

Well, those hoping for a wider selection of Archimedes games got their wish, but BBC games' players were bound to be disappointed. There were less than 20 games considered for nomination in this year's charts, and you can find my personal top three later on. But first, on a more positive note, my top 10 Archimedes games of 1990, from a total of about 40.

ARCHIMEDES TOP TEN

No 1 Interdictor II

Clares. Tel: (0606) 48511
Graphics: *****
Addictiveness: *****
Value for money: ***

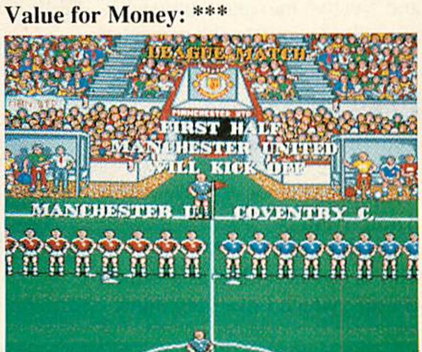
This game is probably the best flight simulator you can get for any home computer. I like the fact that it is an on-going game, but most of all it has the personal touch. I can get engrossed in battling with another fighter, and if I lose (perish the thought) I select flying-brick mode and just zoom up behind the guy with a cocky grin.



Interdictor II – probably the best flight simulator around

No 2 Manchester United Football

Krisalis. Tel: (0709) 372290
Graphics: *****
Addictiveness: ****
Value for Money: ***



Manage the fortunes of Man Utd

Both the management and arcade aspects of soccer are featured in this game. The former allows very complex tinkering with the works of the Manchester team, ranging from transfers and training to progress reports and fixtures. I normally skip all that when I play, but the up-and-coming managers among you will love it. The physical side is based on the 3D view in the brilliant *World Cup*, as seen in pubs and arcades, and it lacks none of the performance. My only gripe is the lack of a two-player keyboard option, which *Arcade Soccer* has.



Chocks Away: excellent fun

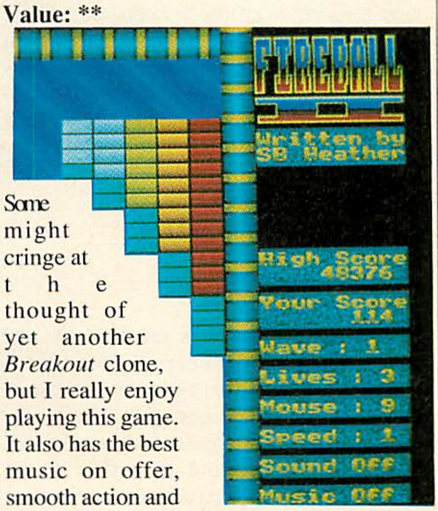
No 3 Chocks Away

Fourth Dimension. Tel: (0742) 700661
Graphics: ***
Addictiveness: *****
Value for money: ***

This is *Interdictor II*'s only rival, but there are many differences (see review). Three features stand it out against its rival: a black box flight recorder, a two-player option and an outside view of the plane. However, it is slow and lacks graphical detail, but the aircraft carrier's good. Excellent fun.

No 4 Fireball II

CIS. Tel: 071 - 833 4023
Graphics: ***
Addictiveness: **
Value: **



Some might cringe at the thought of yet another *Breakout* clone, but I really enjoy playing this game. It also has the best music on offer, smooth action and good game-play. *Breakout* is bat 'n' ball and *Fireball II* is super-bat 'n' fireball.



No 5 Arcade Soccer

Fourth Dimension.
Tel: (0742) 700661
Graphics: **
Addictiveness: ****
Value for money: ***

If it's real football you want, *Manchester United* is the one to go for, but I like *Arcade Soccer* for its simplicity and humour. There are no fouls, penalties or management of any sort, but it's good clean fun. Booting the ball hard through 960 degrees, playing in torrential thunder storms and making noises like a tortured parrot with hiccups ought to confuse the goalie enough to ensure a goal.

No 6 Starch

Alien Images. Tel: 061 - 766 8423
Graphics: *****
Addictiveness: ***
Value for money: ***

Starch is probably the only original concept to have hit the games scene this year. It places you in the role of a laundry manager working overtime to keep your job on the machines. Harry and Dave battle it out against the washing before the time runs out. *Starch* works for about a month in one-player mode, but find a friend and you'll be hooked for ages.

No 7 Pipemania

Empire. Tel: (0268) 541126
Graphics: ****
Addictiveness: ****
Value for money: ***

In *Pipemania*, flooze is on the leak and only a dextrous plumber (if that isn't a contradiction in terms) can avert a catastrophe (a 'game over' message). The player arranges pipe sections in such a way that the unstoppable liquid may flow to its heart's content, or you run out of pipe space – whichever happens first (guess which!). *Pipemania*'s principle is to stop the flooze and not shoot the baddies. This is one of a growing pool of puzzle games to flood the games scene.

No 8 Nevryon

Fourth Dimension. Tel: (0742) 700661
Graphics: *****
Addictiveness: ***
Value for money: ***

Based on *R-Type*, *Nevryon* provides you with a basic space ship and a host of nasties. Shoot enough of them and a bonus pod will appear for you to pick up. Enhancements to your ship go on like this until rapid fire, shields, gun droids and handy rocket launchers render you virtually unassailable. But bow your head in shame, 4D, because the minimum time between 'game over' and 'ready' message approaches two minutes due to the special effects.



Nevryon – a space-age shoot-em-up

No 9 Apocalypse

Fourth Dimension. Tel: (0742) 700661
Graphics: *****
Addictiveness: ***
Value for money: ***

This is best described as a 'shoot-em-up', which I like very much – so you may wonder why this one doesn't rank higher. The only reason I can think of is that it isn't very personal. Most targets are static and there are very few 'intelligent' enemies to avenge on receipt of enhanced firepower – as there are with *Interdictor II* or *Exile*, for example. Nevertheless, this game has nice graphics and is good fun.



No 10 Ballarena

Sisteme. Contact: 4 Rue De Massacan, 34740 Vendargues, France
Graphics: ****
Addictiveness: ***
Value for money: ***

Ballarena is the second game of *Breakout* origin in the charts, but is the first to come from France!

There's also a new angle – up! Well, around to be exact, because the bat moves in a circle. The bricks aren't exactly uniform either and there are 'things' flying about all over the joint. It's whacky and wonderful! A must for your game collection.


Apocalypse has nice graphics and provides lots of fun

BBC MICRO TOP 3

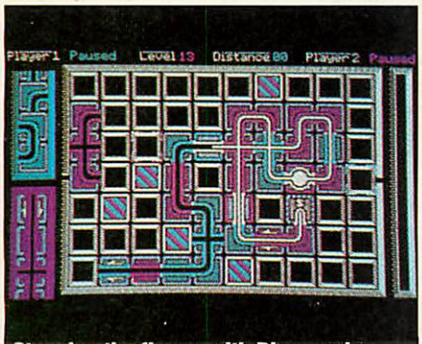
No 1 Nevryon

Fourth Dimension. Tel: (0742) 700661
Graphics: *****
Addictiveness: ****
Value for money: ***

The eight-bit version of *Nevryon* is as good as its 32-bit counterpart, possibly better. Of course, the graphics are not as good but everything else is just right. The amount of baddies to deal with versus the sophistication of your ship is well matched – with Arc *Nevryon*, I think both of these factors are slightly over the top. This one though, is spot on. I love it.

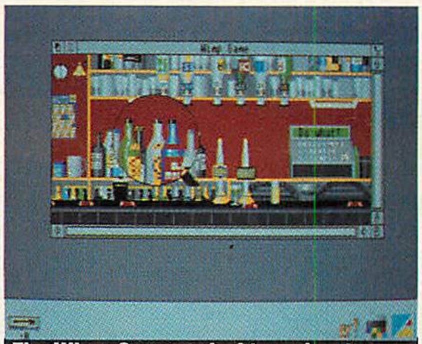
No 2 Pipemania

Empire. Tel: (0268) 541126
Graphics: ***
Addictiveness: ****
Value for money: ***



Stopping the flooze with Pipemania

All the Beeb version lacks are Arc graphics and power. Apart from that, we're talking about two very addictive versions of the same game. Flooze is the stuff to be stopped, pipes are the way to do it.


The Wimp Game–a desktop adventure



Break 147–snooker in the third dimension

No 3 Ricochet

Superior. Tel: (0652) 58585
Graphics: ****
Addictiveness: ***
Value for money: ****

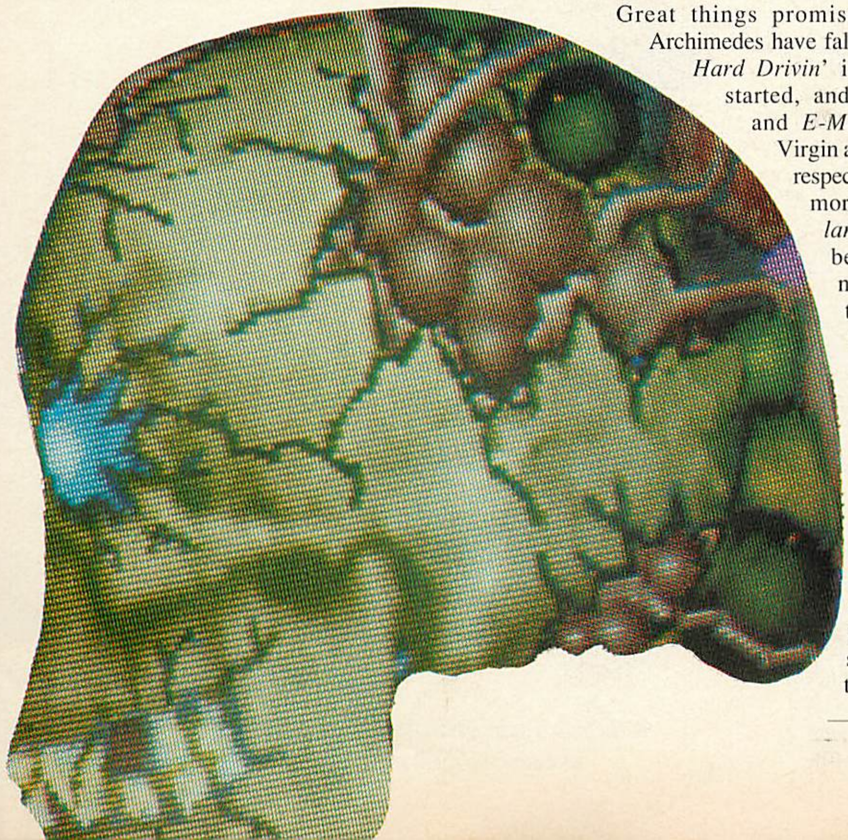
Described in the review as 'an excellent problem solving game,' *Ricochet* puts you in the role of Sprat, a red bouncing ball designed to explore new worlds. Although it has its own personality, *Ricochet* is basically *Citadel* with a new map. Perfect for arcade adventure fans.

GAMES NEWS

A couple of things should be said about the top games listed above. First, the choices were personal – nothing to do with sales figures, just my own favourites. Second, they were compiled in October, so anything appearing later will have been omitted, though I've managed to have a look at most of the new stuff.

For Beeb owners, things don't look good. Superior Software is the only company dedicated to the market, which it claims is still a worthwhile cause – and it is.

Great things promised for the Archimedes have fallen through. *Hard Drivin'* is yet to be started, and *Monopoly* and *E-Motion* from Virgin and US Gold respectively are no more. *Wonderland* ought to be out early next year though, and as for *Karma*, the seven disc 3D space epic, a Christmas release is possible but not at all probable. Superior is set to release the game it perceives as its flagship of 1990 – *Sim City*. In this you have a whole city on your plate, and must keep things running smoothly.



Traffic, pollution, population and the odd tornado all contribute to anything but the average nine-to-five job.

Master Break is a quiz game with snooker as its main theme. Answer the easy red questions before advancing onto the colours, with over 1500 questions to get right! Superior's taxing game will be out for Christmas on all formats.

The Fourth Dimension has a plethora of Archimedes games on the production line. *The Wimp Game* is a desktop graphic adventure game all about Acorn's 10 year history. Objects range from Atoms and BBCs to Arcs and R200 workstations! *Drop Ship* is a *Thrust*-style game like *Rotor*, but even better. The usual plot of manoeuvring through caves while shooting and collecting is employed, along with some good graphics. *Break 147* is a 3D snooker game from Orlando built along the same lines as *3D Pool* (hopefully available for the Christmas market).

Good news for *E-Type* fans. Author Gordon Key is working on a new 3D car racing game which is apparently on the same 'tracks' as *Grand Prix*. *Powerband* is a Formula One racing simulator and is expected to be different to *E-Type*, which was more of a game rather than a simulator.

The error of my ways has been pointed out to me by J Briant of Barton-under-Needwood in Staffordshire. In October I complained that Arc games should return to the desktop after you've had enough of them – but, of course, this is asking too much. Games tend to be written using 'illegal' code and continuing work in desktop could be dangerous with dodgy data aloft in the memory. Also, authors want to rid the computer of the game completely to avert the possibility of copying. Thanks Mr Briant, you're quite right. I'll just have to think of some more niggles instead!

The Game Show will be back next month with an update on the best buys plus the first in a short series on *Exile*, Superior's brilliant arcade game.

Sam Greenhill

The Main Difference Between InterDictor 2

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You'll also find a modern jet fighter a little too large for your tabletop and, unlike Interdictor 2, it requires around 25 groundstaff to get it airborne.

Best to stick with flight simulation, we think. And with that in mind, allow us to introduce Interdictor 2. It is written by the same people who brought you Interdictor but it's bigger, better, smoother and (believe it or not) faster.

It has a more realistic aircraft model, an easy to fly training mode, a new navigation system allowing route planning, way point setting and mission pre-planning. Added to this is LOCSAC a new local Situational Awareness Computer that allows you to monitor the local situation. You'll fly over 10,000 square kilometres of trees, mountains, roads, rivers, railways, lakes and much, much more.

The main scenario contains nine sub scenarios of varying difficulty. There are more types of air and ground vehicles with more weapons. Enemy aircraft have more in-built intelligence and defence, and let's not forget one vital point; they're all out to get you. And there lies the real difference between a genuine jet fighter and Interdictor 2.

If you get shot down, with Interdictor 2, you simply start all over again. And, by the way, Interdictor 2 only costs **£34.95 (inc VAT).**

CLARES

MICRO SUPPLIES

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Chocks Away

Fourth Dimension. Tel: (0742) 700661
Archimedes £24.95

So what does the Fourth Dimension's sly invasion of the Archimedes flight simulator market have that *Interdictor II* doesn't? Well, a two-player mode is the obvious answer, another is the spotter plane view of your Tiger Moth.

But *Chocks Away* is not really a flight sim, as 4D admits, and it's very easy to fly. There are three ways to play the game – in practice mode, dogfighting with a friend and a third involving completing the missions, alone or with a wing-man.

All three are enormous fun, but playing two-player missions is particularly enjoyable. Another very nice feature is the 'black box' flight recorder. With this it is possible to save flights to disc and replay them later. When replaying, there is a fast forward feature and the facility to take over control at any point. This is something I've always wanted to see in a game.

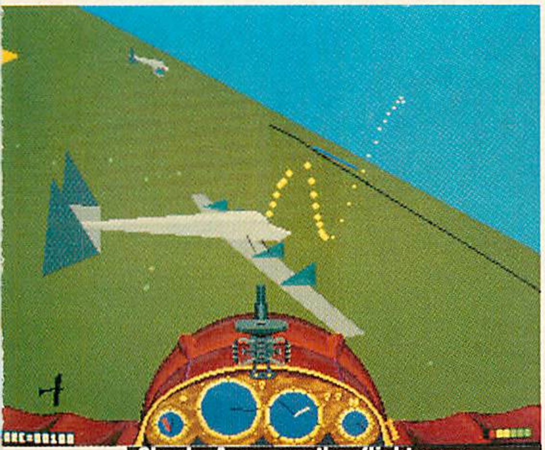
The missions take you over both land and sea, and later it is necessary to land on aircraft carriers – well, try anyway. The missions are not interconnected, as with *Interdictor II*, but are completely isolated from one another. This does prevent a certain sense of strategy in the game as a whole, but that's not a major gripe.

Explosions and smoke are nicely detailed but enemy planes put up a good fight before they let you see these! I think there is a supernatural protection field around the church though – it won't blow up!

Chocks Away is slow compared to the smoothness of *Interdictor II* – it was unbearable at first but I soon got used to it. The ground detail is pretty minimal and the graphical resolution is generally fairly coarse, especially in two-player mode. Otherwise, the game is very playable.

Sometimes long flights before the target is reached can become boring, and with no auto stabilisers I often crashed because I wasn't watching the screen. However, it's easy to load back in the flight data and fast forward to just before the fatal dive, so no major worries. *Chocks Away* is a brilliant game. It is actually very different from *Interdictor II*, and rich readers are recommended both! On a value for money basis they rank equal, and I like both for completely different reasons. My main complaint is that *Chocks Away* is too easy. After five hours I was a confirmed Flight Lieutenant, with only a few missions left to complete. Though *Chocks Away* lacks sophistication and 'power' it has bags of charm and elegance.

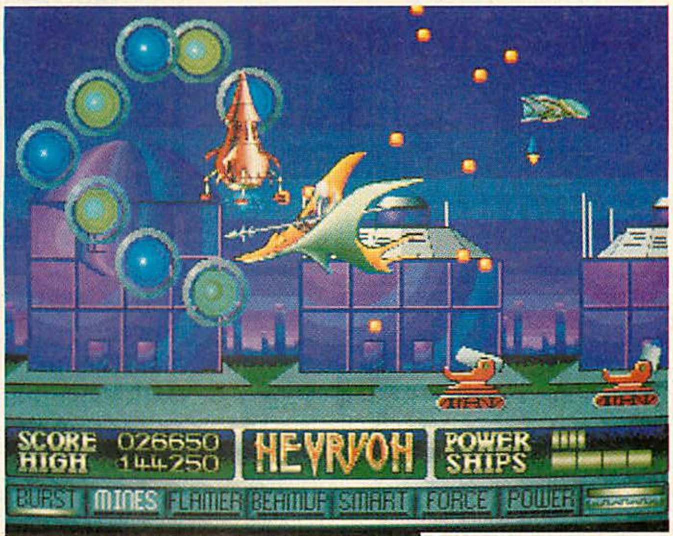
Sam Greenhill



Chocks Away: another flight game

Nevryon.

Fourth Dimension. Tel: (0742) 700661
Archimedes £19.95



Nevryon-an amalgam of arcade games

The best way to describe *Nevryon* is as an amalgam of all the games, such as *R-Type*, you may have seen in arcades, and for the most part I found it played up to its hype reasonably well. The basic idea, as in all games of this type, is to fly along a piece of terrain and blow your enemy to tiny bits by whatever means you feel necessary. As you progress, you can earn yourself extra weaponry and shields which include missiles, remote gun droids, lasers, a defender-ram and a 'flamer', which shoots forth enormous tongues of fire when activated.

Your adversaries range from giant tadpole-like creatures to heavily armoured helicopters and there's the odd bat or two in there as well. More than a few features of this game really are excellent – for example, the way rockets and spacecraft ignite their engines and then zoom off.

The smallest details are all there – bullets which miss their targets ricochet off the scenery, and convincing dents caused by misfired missiles. While you are manoeuvring your ship through the hazards of the planet Nevryon, it is sometimes difficult to distinguish background graphics from obstacles – frustrating when you blow up after flying through a pylon.

On the gripes front, it takes a full one minute and 40 seconds to start the game from scratch as you have to go through several slick, but tedious, menus, starscapes and scroll messages. Another thing missing, but promised by the advertising for the game, is the 'beautiful animation' of the end-of-level nasties, which just sit there like nicely drawn lemons.

Overall, this has to be one of the best games yet for the Arc, but my two main criticisms are the somewhat misleading blurb and the fact that a couple of the levels might be too difficult for some people. This is a better than average 'shoot 'em up'.

Mat Tizard

Helter Skelter

Audiogenic. Tel: 081 - 861 1166
BBC disc £14.95, BBC/Electron cassettes £10.99

Helter Skelter from Audiogenic is a strange game. I can't offer you the name of a single game on the Beeb that it stems from, though it is similar to *Overload* on the Arc.

You control a little bouncing ball called Billy. You can move Billy left or right and control his bounce. Holding down the bounce key simply accelerates him downwards, meaning that you can either make Billy bounce higher by holding the key when he is going down, or stop the bounce by holding the key when he is going up. Take my word for it, it's easier to play than it is to explain! Bobby Ball can play at the same time, so this game is one or two player.

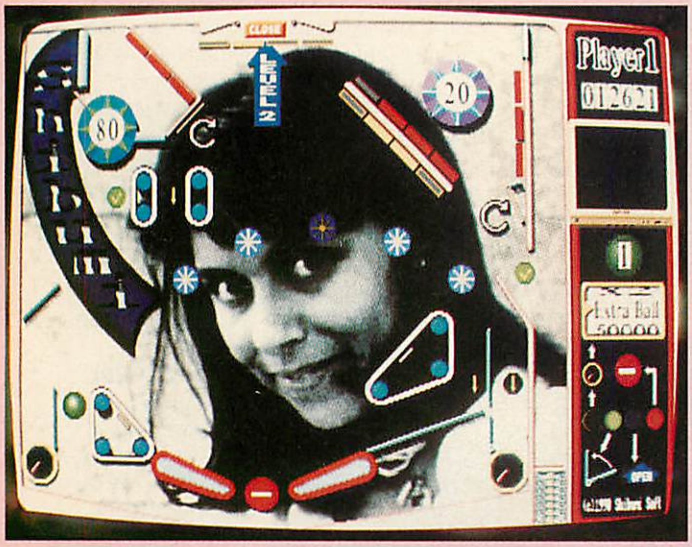
You have to destroy monsters with Billy and Bobby by bouncing into them. However, crashing into everything that moves is not the solution – a little arrow indicates the monster to blast next. On the way to that monster you have to be careful not to bump into another, or it gets mad and splits into smaller versions. The more monsters you make the more difficult it is to destroy them all before your time runs out.

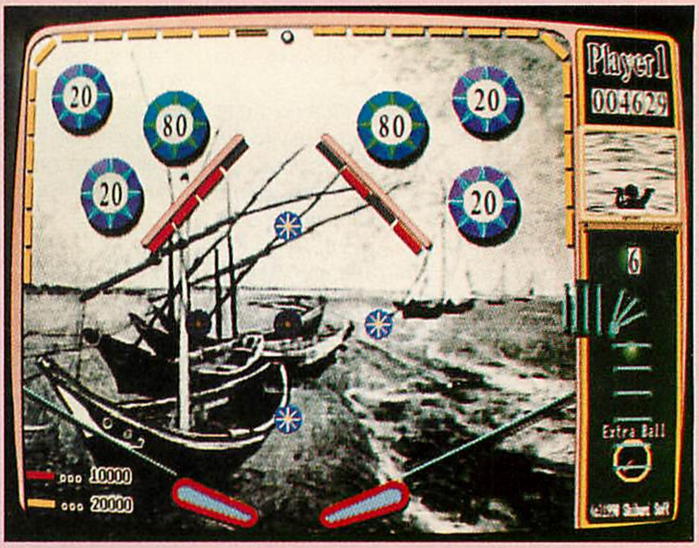
I found that the timing was pretty fine. More often than not I descended upon the final rogue, stopping the clock with a tenth of a second to go, and a large sigh of relief.

Graphics are good, much what you would expect from the Assembly Line programming team – big, cuddly and mode 2. The monsters don't look too menacing and blasting them can only be compared to beating

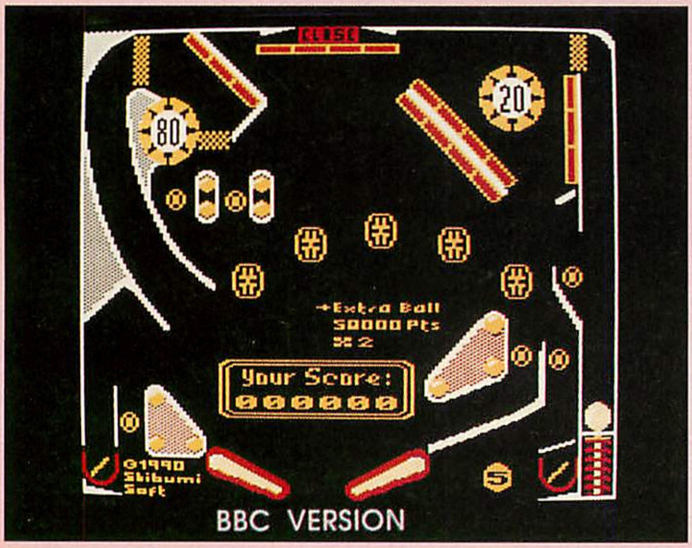
ARCPINBALL

A lot more than you would expect of a pinball game.



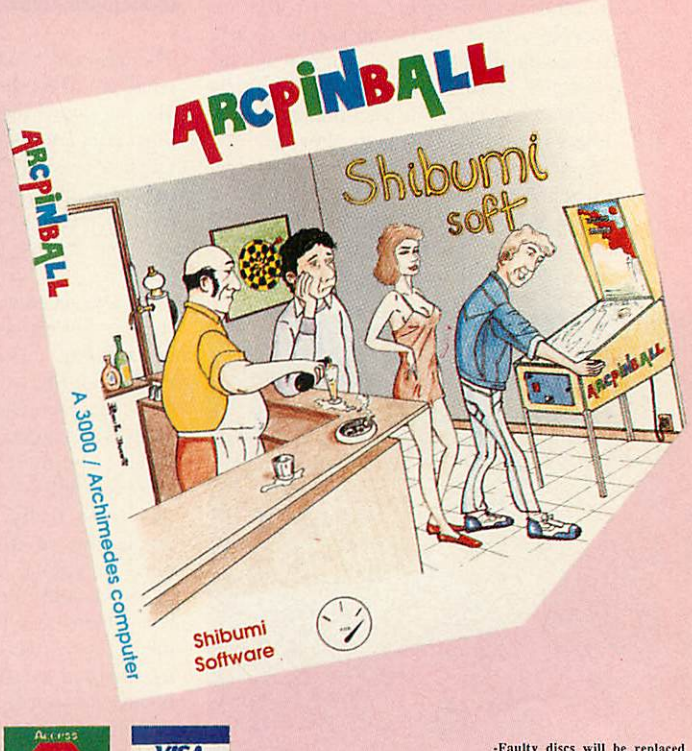


ArcPinball is the best pinball computer game ever seen.
It was written for the Archimedes and uses all the power of the 32 bit RISC processor - there are no AMIGA or ST versions.
Ball movement is very close to the real thing and animation is smooth and realistic.
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High quality stereo sounds are used and the VIDC chip is reprogrammed to improve the screen resolution (768x272, 256 colours).
ArcPinball runs on all Archimedes with at least 1MB of memory and RISC OS.
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up your teddy bear!

There is a level editor, although it's not much use as there are plenty of levels to tackle already without adding your own!

All in all, fun-filled frustration.

Paul James

Mad Professor Moriati

Krisalis. Tel: (0709) 372290
Archimedes £19.95



Platform and Ladder games for the Arc have been terribly thin on the ground up until now. It's good then, to see one of the better Amiga versions being ported over. *Mad Professor Moriati* puts you in the shoes of said scientist and you must close five of your equally mad laboratories to preserve your sanity.

Each laboratory is inhabited by a suitable collection of weird and wonderful denizens, including man-eating floppy discs and dancing flowers. Some enemies can be stopped by throwing spanners at them, but much more effective is the deadly Virus Killer which stops anything dead with just one splurge.

As usual in this type of game, there are a number of puzzles that have to be solved in order to complete each level. Most are quite simple, although it helps if you have a sense of humour. Having finished the game myself, I can reveal that blackcurrant jam can improve your eyesight and cereal will keep you warm!

Graphics are of the 'small n' cute' variety, especially in the case of animation. The aforementioned dancing flowers strut their stuff and skeletons shake, rattle and roll as they walk by.

The backgrounds to each level are filled with an impressive array of spinning cogs, flashing lights and general science laboratory regalia.

Humour creeps into the animation, particularly when you pause to take a break. Mad Moriati stops for a while, wipes his glasses, and then knocks impatiently on the monitor to wake you up.

The sound of knuckles on glass is a nice touch and it certainly made me sit up and pay attention.

Mad Professor Moriati is yet another excellent Amiga conversion from the keyboard of Shaun Hollingworth/Krisalis.

This game doesn't exactly stretch the Arc's capabilities too much, but is welcome none the less.

Rob Miller



Mad Professor Moriati is an excellent 'Platform and Ladder' Amiga conversion

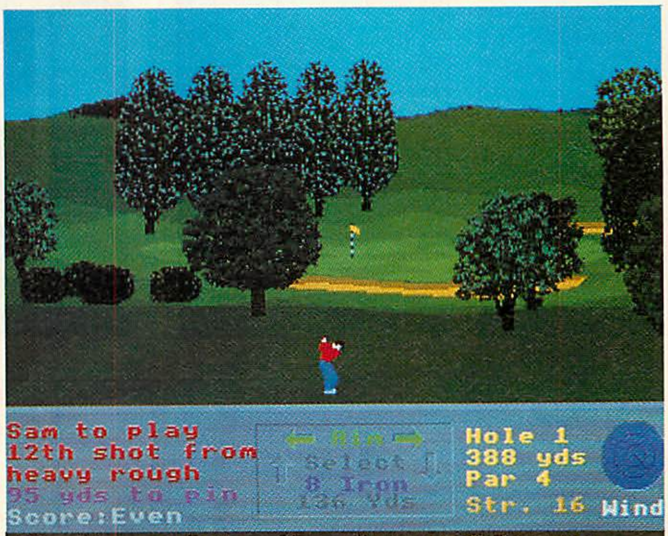
Microdrive

CIS. Tel: 071 - 833 4023
Archimedes £19.95

Hobble off *Holed Out!*, lose *Leaderboard* and shelve *Superior Golf*, for I'd like you to meet *Microdrive*, your unconventional new rival. Following in the footsteps of *Fireball II*, CIS's golf game is set to score a hole in one.

But *Microdrive* is a simulator, not a game, because it passes the true test of a simulator – it's very difficult to play! The golfer is controlled directly, none of that namby-pamby power meter stuff. The mouse, as ever, is used to do this and lots of practice is advisable. It's typical that the easy golf games have practice greens when they're not really needed, and then along comes one in which a bit of practice is vital, but . . . no practice green!

Microdrive has proper contours and the two courses provided contain plenty of hills. This, added to the excellent graphics, makes for a very realistic course. The enormous variety of trees is nice, and these are very well drawn. When (not if!) the ball hits one it deflects, falls or travels straight through depending on the position of the branches.



Microdrive–excellent graphics and a very realistic course

The attention to detail is good. For example, the ball disappears from view when in the rough and even the advice on how to play is given in a 'commentator' style.

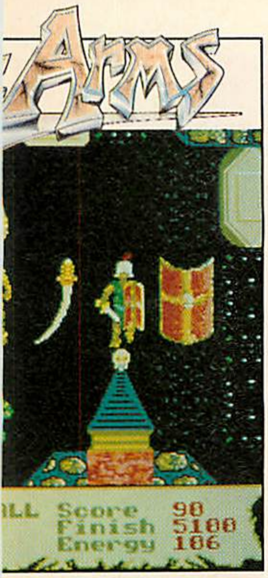
On the down side, *Microdrive* suffers from Basic-itis and is very slow. The front end is bad and club selection is rather tedious. It would have been nice to see the information box disappear when it is not needed – being ugly, it contrasts badly with the peaceful scenery of hills and trees.

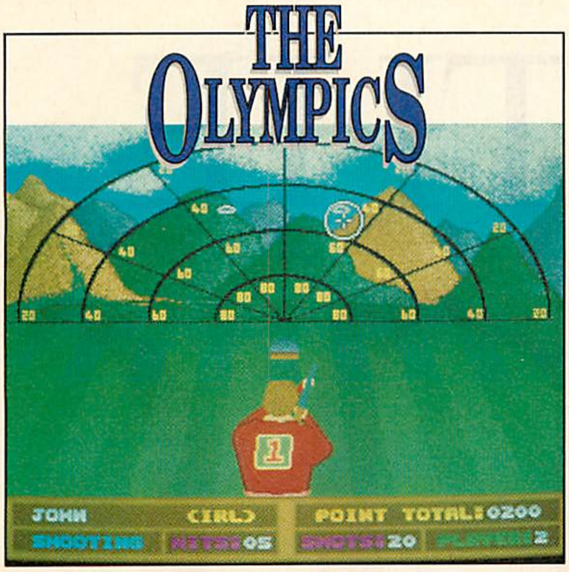
Microdrive is a commendable attempt at solving the problem of artificiality in previous golf games, though it could be argued that the artificiality is good since it makes playing both fun and easy.

Sam Greenhill

DIMENSION

A3000 ARCHIMEDES BBC B/MASTER ELECTRON







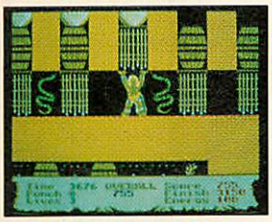
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THE OLYMPICS

The Olympics is an experience which can be played by 1 to 8 players. It contains a superb piece of music, opening and closing ceremonies and 14 national anthems. When a player wins a gold medal the national anthem for his chosen country is played. Any World Records that you achieve can be saved to disc. With the click of a button all the relevant information concerning the record is automatically saved including your name, the exact time, day and date!

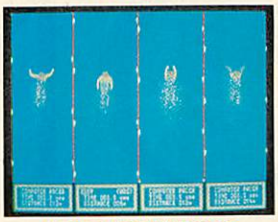
It is comprised of 6 main events: Diving, Shooting, Javelin, Swimming, Canoeing and Pole Vault. Some of these have several "sub-events" to choose from - there are 2 Shooting events, 12 Swimming events and 3 Canoeing events. These events have been chosen for maximum variety and enjoyment. They will "extract" all sorts of abilities: manual dexterity, timing, memory, perseverance, adaptability and above all guts!

The menu systems are controlled entirely with the mouse. As such they are extremely easy and quick to use. All events can be practised or competed individually, or altogether for maximum Gold, Silver and Bronze medals. You can also play all 6 events as a sort of "hexathlon" where points are awarded for each event - the player with the greatest number of points is deemed to be the winner. For each event - the player with the greatest number of points is deemed to be the winner.

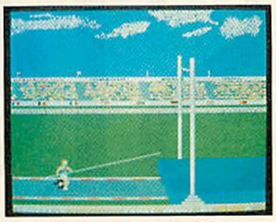
"Compilation packages of sporting events may have been round on other machines for ages but the first one for the Arc is every bit as good .... VERDICT: A Gold Medalist" .... ***A&B Computing June '90***

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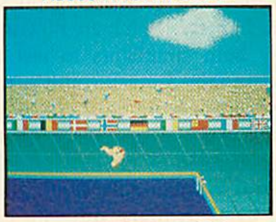
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NEVRYON

This fast arcade game is disc based only and boasts 100k of graphics and game code for the BBC Micro and 2 discs of over 1.5 megabytes for the Arc. It is a fast sideways scrolling shoot'em up which features 8 levels of furious opponents and very varied and very detailed graphics.

Whilst the BBC Micro version is superb the Arc version has been considerably enhanced and is truly exceptional putting many arcade games to shame.

"If you think that games for the Archimedes are a bit second rate, then you're out of date because now there's Nevryon .... Nevryon features the best graphics and sound I have ever come across. All of the superb sprites are packed with amazing detail and the animation and scrolling are completely flicker-free. Sound 10, Graphics 10, Playability 10, Value for money 10, Overall 10." .... ***Micro User Nov '90***

"The 4th Dimension have come up trumps with another classic ....Graphics are superb .... The number of animated objects, missiles, scenery and details will put many an ST and Amiga to shame with the sheer power of the ARM chip. Who needs a blitter for fast action? .... to sum up, another unbelievable game that pushes the Archie standards even higher. Buy it now." .... ***Micronet Aug '90***

"The raw processing power of the Archimedes is fully exploited to provide a superb, flicker-free scrolling backdrop which includes large sprites, 256 colours and six levels of parallax scrolling .... Coupled with background music, explosions and over sixty on screen sprites excitement is guaranteed all the way .... Nevryon is the first true arcade style game for Archimedes owners to reach for their joysticks for." .... ***ACE '90***

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THE 2nd MISSION

SAM GREENHILL interviews the masterminds responsible for Clare's new flight simulator package, Interdictor II, and finds out just how close to the real thing it actually is


The Simis team, from left, Baverstock, Tubbs, Newth and Payne

Interdictor II is the thinking person's *Interdictor*. So says Chris Tubbs, commercial director of Simis, the company responsible for programming the Arc's first flight simulator, and its sequel – *Interdictor II*. I talked to him about how the sequel was written, but I also wanted to know why Clares had chosen the Simis team to write the game in the first place. I soon found out.

Chris Tubbs was a project engineer at British Aerospace until two years ago, when he and three others decided to leave their highly paid jobs for the big wide world. The other three – Jonathan Newth, David Payne and Ian Baverstock – were all technical engineers at BAe working on software for the fighters (which are now in the Gulf). They built simulators to test new flight software (and I mean 'built'), making them the ideal choice.

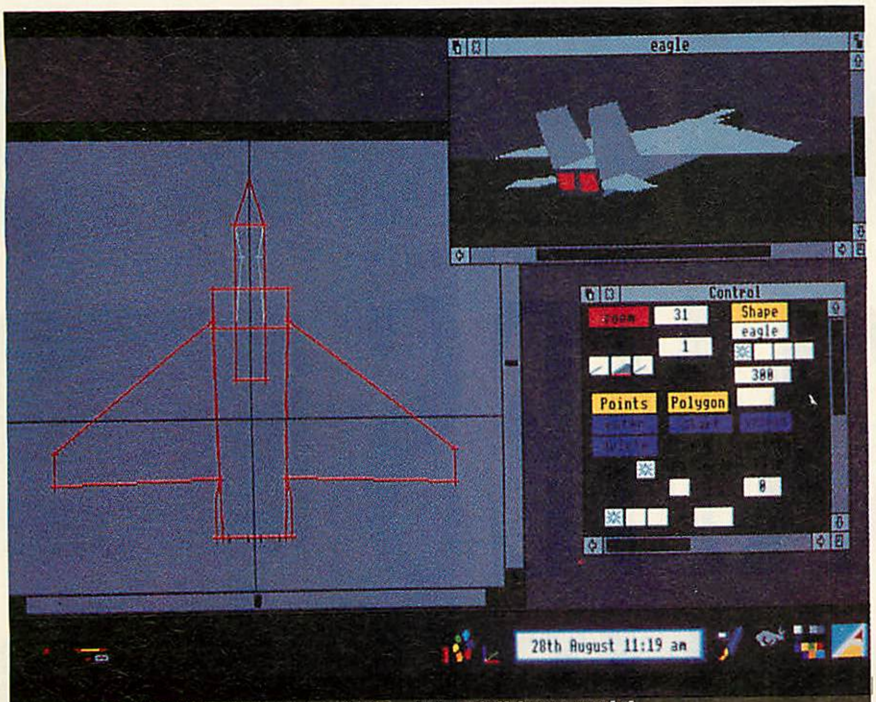
Interdictor was the first piece of software to be generated by the newly-formed Simis, and was written in the living rooms of the four ex-BAe flight software engineers. *Interdictor* received some quite favourable reviews, but were the authors themselves satisfied with it?

'No, we knew we could do better,' said Tubbs. 'There was a lack of detail in the original and we knew that we'd done the scenario wrong: square is much better than long and thin. We received a lot of letters from players with comments on the game – one guy from Japan wrote in full of praise and boasted 1200 hours in a Harrier jet prior to commercially flying a 747. He said *Interdictor* was fantastic – but did we know we'd got the engine model wrong!

'All this and more meant we knew exactly what to do with the sequel – all that remained was to write it.'

Did this involve fine tuning or a complete re-write? '*Interdictor* taught us some lessons, but we started from scratch. *Interdictor II* has been coded entirely in modular form. We wrote a series of 'building blocks' which fit together to make the game.

One handles collision detection, another the enemy, and so on. That way, we can



The aircraft simulator is very accurate – it is a full force model

easily use the same blocks in other simulators later on without having to hack into *Interdictor II* to get at them.'

There are about 30,000 lines of program in *Interdictor II*, split roughly into 350K of C code and 50K of Arm assembler. All the polygon fill and line drawing routines – the fast stuff – are handled by the Arm. But the real speed comes in the decisions that were made with the C code. For example, when do you switch from an object being represented as a pixel to it becoming a line, to a skeleton, to a solid polygon?

'We wrote what's known as a "hierarchical database" to deal with the problem,' explained Tubbs. 'This is essentially a tree structure and all the program has to do is decide where on the tree it is and the tree tells it what to draw. This is determined by the distance of the *Interdictor* plane from the object.

'Another problem is that the entire scenario must be updated all the time, regardless of what the pilot is looking at. Then there are the enemy tactics. Most of the planes, trains and automobiles follow predetermined routes, but, once you get behind a fighter, an expert system takes over and plans out every move it makes. That, added to the enemy's ruthless determination to slide in behind you, makes it very hard to keep the speed reasonable – but it's great fun to play!'

The 3D graphics, plus the map and enemy routes were all designed on the Archimedes, using applications produced by Simis. The graphics and route designers are quite user-friendly and when I suggested they be released as a supplement to the game, Tubbs said it sounded like a good idea. Fingers crossed. Some companies have regarded the Archimedes games market as relatively fruitless, so why didn't Simis? Tubbs explained: 'We don't make a vast profit with the games, but we write them because they're fun. We would also like to encourage a lot more people to buy the Archimedes, because it's so much further along the road technologically – it's the only machine worth buying.

'The big money comes from business and professional simulation projects. But also, the fact that all the tools used to build *Interdictor II* are deliberately modular means that we can use them with other software, so nothing has been wasted.'

At British Aerospace, the Simis team worked on some interesting projects. Using Silicon Graphics and Sun workstations, they built various simulators using large VDUs (10 by 10 feet!) and walls of speakers. One was a cockpit constructed for ergonomists to use when they are trying to design a comfortable arrangement of controls and displays. The RGB projector used for that project was so old it carried a radiation warning sign! Tubbs remarked that software houses should all consider ergonomics when designing front ends for software.



Interdictor II is as realistic as you can get

The team considered weather simulation, but to have effects such as fog, changing density would require an even faster machine. Cue, Acorn?

The aircraft simulator itself is very accurate, according to Tubbs: 'Technically, the aircraft is a full force model. This means that the pilot operates the wings, rudders and engine and the conditions dictate how the aircraft actually moves. In other flight sims, the pilot controls the direction, not the plane. You seem to be able to pull the nose up into a climb and not slow down – that's ridiculous! What's this thing called gravity that sticks us to the floor? In *Interdictor II*, flying in a circle produces sideslip and climbing slows you down. 'The weapons are modelled correctly, too. The rockets fly aerodynamically and sidewinders spiral in to their targets, as in real life. It's about as realistic as you can get on a home computer.'

The *Interdictor II* aircraft is based rather loosely on a Harrier, without the twiddly nozzles. 'The way we wrote simulators at BAe was to start with what we thought was the right model for the job, and then invite test pilots to try it out,' explained Tubbs.

'When I was project co-ordinator on the Nimrod simulator for the MoD we took all the aircraft data available, built the cockpit, wrote the software and then brought in a pilot for a subjective test.

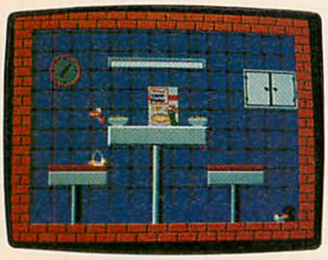
'If he said the vibration level for a particular manoeuvre was wrong, we would tweak various parameters until he was satisfied. With *Interdictor II*, we asked contacts at BAe to test it. Dave, our simulation expert, is a pilot but he helped write it, so he's not very objective!'

Given more time and money, what would an *Interdictor III* do? 'What wouldn't I like to do! I would like to see the computer simulate battle with the user as part of the fleet. It would be far more strategically aligned, with every decision made contributing to the success of your side. Multiplayer options using serial links between machines should also allow formation flying. But we're looking at five or six years of work and a lot of money up front!'

There may be reservations about war games in current circumstances. But, with all their expertise, it is probably just as well that the Simis team is concentrating its efforts on computer games, rather than deadly weapons. Flight simulators can be played as simulators or as good games with anonymous enemies, and *Interdictor II* goes a long way towards fulfilling both aims.

Interdictor II *(£34.95) is available from Clares, 98 Middlewich Road, Rudheath, Northwich, Cheshire CW9 7DA.*

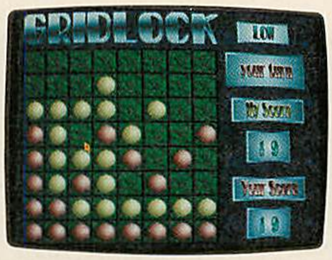
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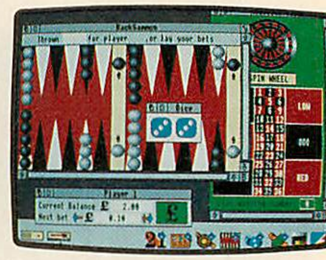
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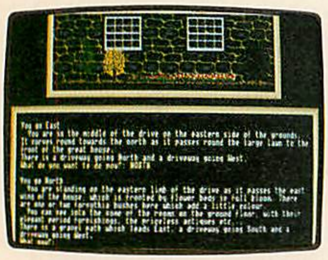


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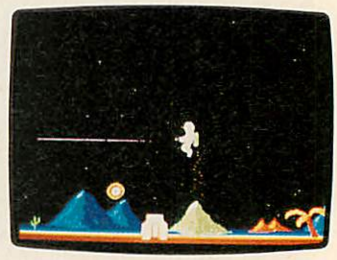


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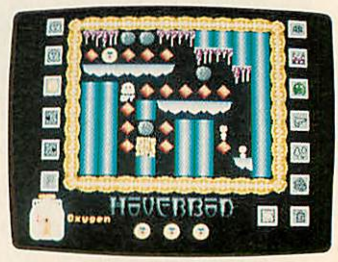
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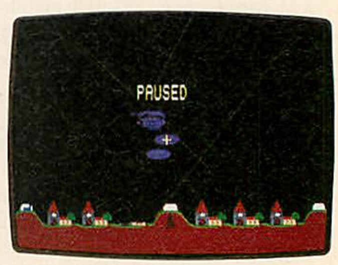
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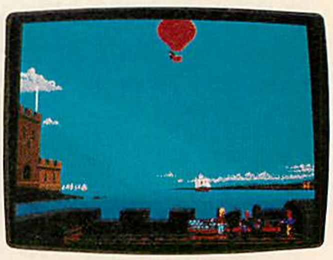
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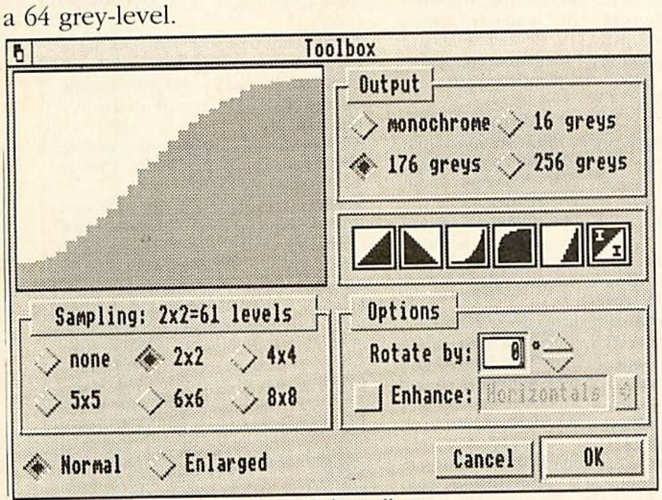
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Scan-Light toolbox.

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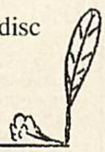
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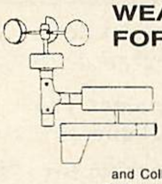
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SOFTWARE SHOWCASE

ACORN USER ADVERTISEMENT PAGES - DECEMBER 1990

BOOKING IN



The Round Reading Room in the British Library

CHRISTINA NEAL studies the A3000 in the British Library

Visitors to the vast reading room of the British Library can hardly deny that it is nothing short of spectacular. A vast collection of books are stacked on seemingly endless rows of bookshelves.

Perhaps the most inspiring sight, however, is that of the students, heads bent over the network of A3000 computers, pecking at the keyboards in a search to find a suitable book. Given their apparent agility on the machines, you might be tempted to brand them computer experts.

However, you could well be mistaken. The software, namely *OPAC (Online Public Access Computer)* was designed to enable the user to get to grips with it straight away. And the queue of students who clearly prefer to wait for a vacant machine rather than rely on the microfiche is a testimony to its popularity.

So what's in the software? Initially, it contains two main options. The first provides information about the system and the second gives instructions on getting the most out of the catalogue. You can also look in detail at the content of individual books, authors or editors.

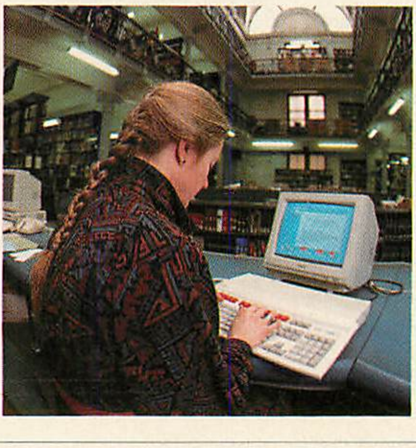
Other options are equally useful. Those wishing to locate a certain book need only enter its title, and tapping in the name of an author will provide a list of their titles to date. *OPAC* can also help those who don't know exactly which book they need. For instance, if you require information about a particular topic, simply entering a key word will provide you with a list of suitable publications.

The list is so comprehensive that entering a fairly common word (such as 'British') could land you with a list as long as your arm!

As you can imagine, *OPAC* has taken a long time to develop. Although five A3000s are currently in use, the development of the system started some two years ago with a network of BBC Masters.

'A test version of the software using the BBC machines was developed in-house in 1988', recalls systems analyst Ivan Dowling. 'It wasn't used by the public, although we did invite some people to try it out. At the beginning of 1989, we converted it to run on the Arc 310 with a screen editor'.

The Arc version was put onto three terminals at Great Russell Street for staff use, and a similar version was installed at Holborn. However, in April, the British Library decided to progress by setting up the network of A3000 computers. 'The decision to use Acorn computers was based on two main criteria', says Ivan. 'One was speed of processing, the other was price. As it started out as a test system, we wanted something low cost that wouldn't involve total commitment in expenditure'.



By July of this year, a more sophisticated version had been written by computer consultant, Lee Calcraft.

'The software has about 300K of source code, some of which is written in Arm code to provide the speed', explains Lee. 'As another part of *OPAC*, there's a graphics and text design program on which screens are created so that the user can generate screens when they hit the buttons'.

The software is fairly straightforward, but where does the vast information on the system stem from? Workstations manager Anthony Brickell explains that it is provided by the British Library Automated Information Service (BLAISE). BLAISE is an online subscription database running on a mainframe at Harlow in Essex.

'BLAISE started out in 1977', he says. 'It runs some 20 databases, and we dive in and get the information on suitable books. It can also supply us with some books too'.

As well as ensuring *OPAC* is both easy to use and detailed, the staff at the British Library have gone to great lengths to monitor the progress of the system.

'We do extensive transaction logs, recording all screens that people search in the reading room so that we can store information on how the system is being used', says Ivan. 'Lee is currently writing a program that will enable us to analyse the system's use – the type of searches people use, the periods of use and so on'.

The future of *OPAC* looks very promising. Anthony Brickell hopes to have the reading room controlled by the A3000 machines by the end of this year.

In addition, a phased move to a new building at St Pancras in 1992 will coincide with even wider use of the computers.

'We're in the early stages of developing a computer system for ordering books as opposed to merely information gathering', says Ivan. 'These machines have potential, and we want to take advantage of this. We have to – by 1996, we'll have over 10 million records to store!'

The reading room of the British Library is located in Great Russell Street, London WC2, near Tottenham Court Road Tube.

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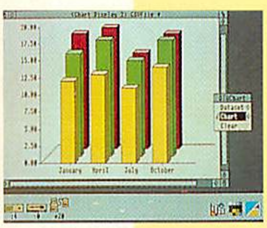
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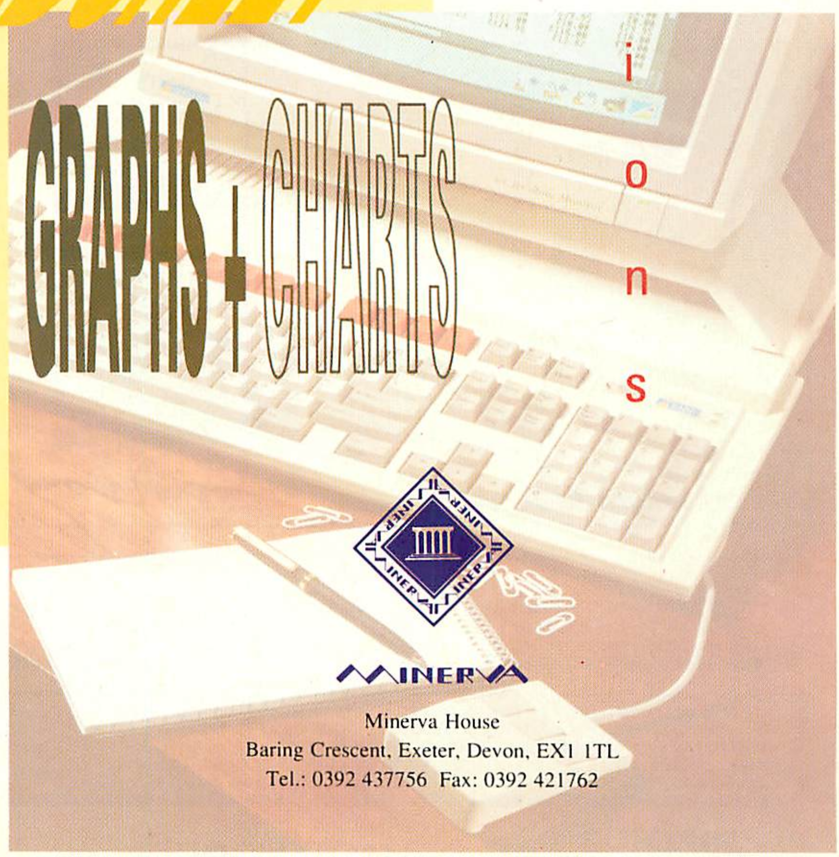
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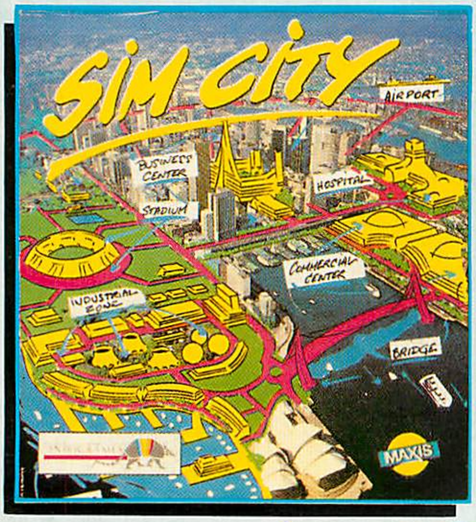
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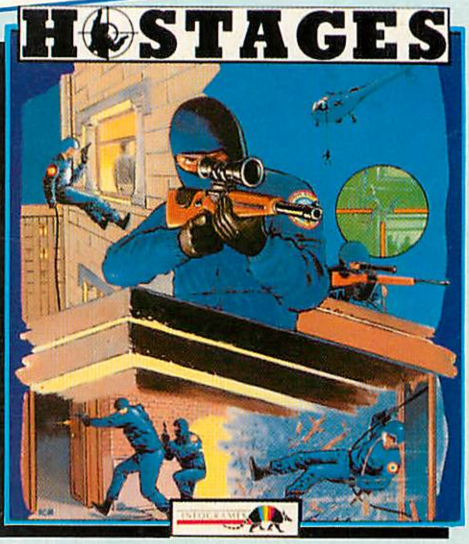
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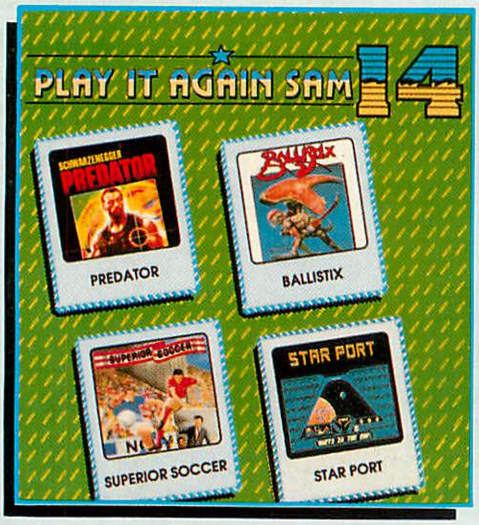


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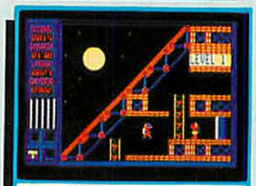
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